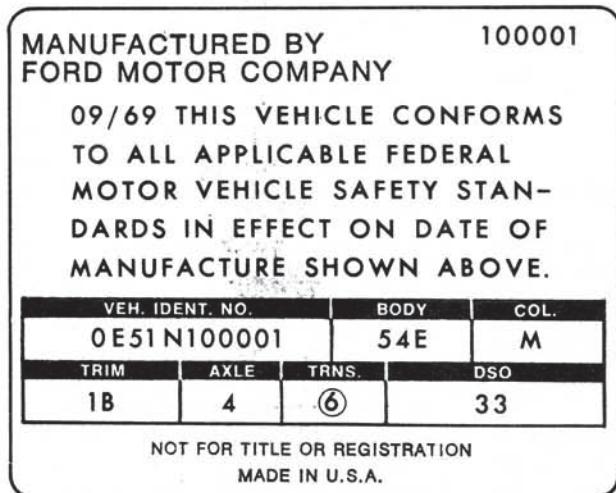


Clutch and Manual Transmissions

**GROUP
16**

PART	PAGE	PART	PAGE
16-01-01	General Clutch and Transmission Service	16-03-01	Ford Design Three-Speed Transmission
16-02-01	Clutch	16-04-01	Ford Design Four-Speed Transmission



CODE	TRANSMISSION
1	THREE - SPEED
5	FOUR - SPEED (WIDE RATIO)
6	FOUR - SPEED (CLOSE RATIO)

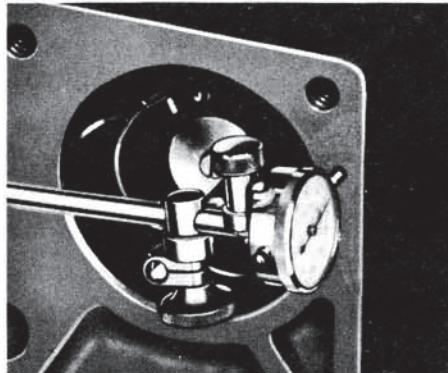
C2134-A

FIG. 1—Warranty Plate

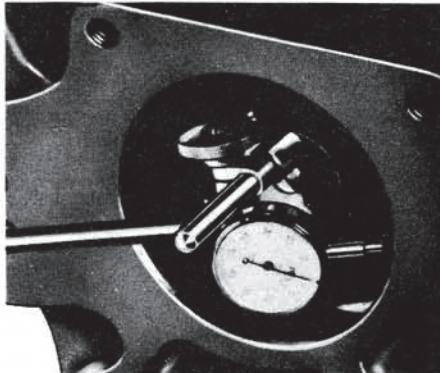
PART 16-01 General Clutch and Transmission Service

DOES NOT APPLY TO THUNDERBIRD, LINCOLN CONTINENTAL OR CONTINENTAL MARK III			
COMPONENT INDEX	All Other Models	COMPONENT INDEX	All Other Models
CLUTCH DISC Cleaning and Inspection	01-04	REAR SEAL BUSHING Removal and Installation	01-03
FLYWHEEL HOUSING Alignment	01-02	RELEASE BEARING Cleaning and Inspection	01-03
PILOT BEARING Cleaning and Inspection	01-04	TRANSMISSION (COMPLETE) Cleaning and Inspection	01-04
REAR SEAL Removal and Installation	01-03	Lubrication	01-03

1 TESTS



CHECKING FACE RUN OUT



CHECKING BORE RUN OUT

C 1783-A

FIG. 2—Flywheel Housing Alignment Check

FLYWHEEL HOUSING ALIGNMENT

Alignment of the flywheel housing bore and rear face with the engine should be checked as a possible cause of any of the following troubles: excessive transmission gear wear, transmission jumping out of gear, especially third gear, clutch pedal vibration or scrubby pedal feel, drive line vibration, excessive pilot bushing wear, or excessive clutch spin time. Whenever any of the above problems are identified, the clutch housing should be given a complete inspection.

INSPECTION

1. With the clutch release bearing removed, install the indicator pilot tool shown in Fig. 2.

2. Clean the face of the flywheel housing bolt bosses, and remove all burrs, nicks and paint from the mating surfaces.

3. Install the dial indicator on the pilot and adjust the holder so the button will contact a circumference just inside of the transmission mounting holes.

4. Push the flywheel forward to remove crankshaft end play. Set the dial indicator face to read zero.

5. Remove the spark plugs to alleviate compression.

6. Pull the engine crankshaft through one revolution. The crankshaft must be held in the forward position while rotating it. The indicator reading must return to zero after one revolution to insure that no end play has affected the reading.

7. Note the indicator reading and mark the maximum (positive reading) point of runout on the face of the housing (Fig. 2).

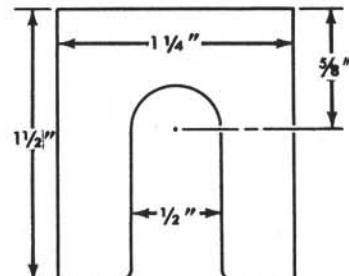
8. Position the dial indicator to check bore alignment (Fig. 2). The bore must be clean and free of burrs, nicks and paint.

9. Pull the crankshaft through one revolution. Note the indicator reading and mark the maximum (positive reading) point or runout on the face of the housing as shown in Fig. 2.

10. Remove the dial indicator from the crankshaft and the housing.

If the bore runout exceeds 0.015 and the face runout exceeds 0.010 and the positive readings occur at more than 90 degrees to each other, the housing should be replaced.

The bore runout should not exceed 0.010 and face runout should not ex-



C 1784-A

FIG. 3—Fabricated Flywheel Housing Shim

ceed 0.006.

If the face reading is positive between the 9 o'clock and 3 o'clock positions, deburring and cleaning of the mating surfaces could make the housing acceptable.

To avoid distortion when assembling the housing, the bolts should be tightened alternately until all are tight, then torque to specification.

Since any change in face alignment will change bore alignment, it may be possible to correct bore alignment by changing face alignment. Face alignment can be changed by shimming between the flywheel housing and engine. Fig. 3 shows the type of shim which can be fabricated.

The shim required is one half the maximum (—) indicator reading, and should be located at the point of maximum minus (—) indicator reading.

If both the bore and face alignment are out of limits, shim between the flywheel housing and engine to bring face alignment with limits. Check the bore alignment.

If the bore alignment is out of limits and the face alignment is within limits, shim the flywheel housing to the limit of face misalignment and check the bore alignment. If it is not within limits, replace the housing.

2 COMMON ADJUSTMENTS AND REPAIRS (TRANSMISSION)

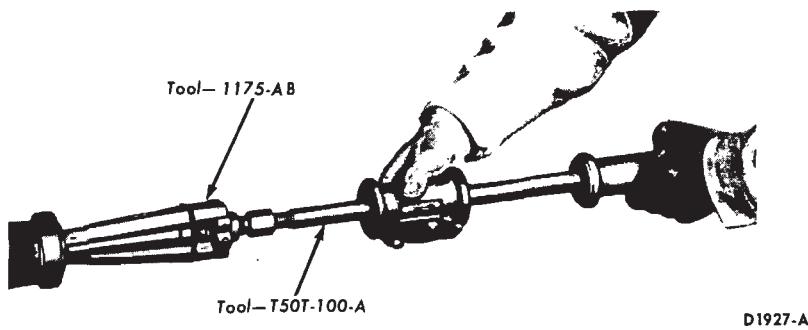


FIG. 4—Removing Extension Housing Seal

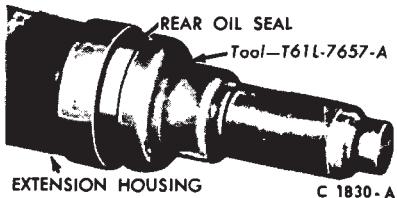


FIG. 5—Installing Extension Housing Seal

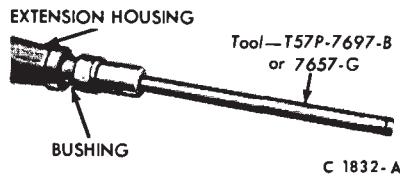


FIG. 7—Installing Extension Housing Bushing

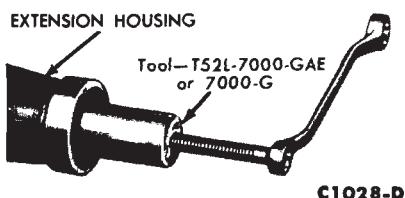


FIG. 6—Removing Extension Housing Bushing and Seal

REAR SEAL REMOVAL AND INSTALLATION

1. Remove the drive shaft.
2. Remove the seal from the extension housing with the tool shown in Fig. 4.
3. Install the new seal in the extension housing with the tool shown in Fig. 5.
4. Install the drive shaft.

REAR BUSHING AND SEAL REMOVAL AND INSTALLATION

1. Remove the drive shaft from the vehicle.
2. Insert the tool shown in Fig. 6 into the extension housing until it grips on the front side of the bushing.
3. Turn the screw clockwise until the seal and the bushing are free of the housing.
4. Drive a new bushing into the extension housing with the tool shown in Fig. 7.
5. Install a new seal in the housing as shown in Fig. 5.
6. Install the drive shaft.

LUBRICATION

Lubricant level should be even with the bottom of the filler hole at the right side of the transmission case.

3 CLEANING AND INSPECTION

CLUTCH

RELEASE BEARING

Wipe all oil and dirt off the release bearing. The bearing is prelubricated and should not be cleaned with solvent.

Inspect the bearing retainer for loose spring clips and rivets.

Inspect the release bearing assembly for burrs which may cause the assembly to drag on the transmission bearing retainer. Any such burrs should be cleaned up with fine crocus cloth. If burrs are found, inspect the transmission input shaft bearing re-

tainer for evidence of scoring. Any scoring should be polished out with crocus cloth. Coat the bearing retainer with a thin film of lithium-base grease (C3VY-19586-A). Prior to release bearing installation, apply a light film of lithium base grease (C3VY-19586-A) on both sides of the release lever fork where it contacts the release bearing hub and retaining springs. Apply a light film of lithium base grease (C3VY-19586-A) plate to the release bearing surface that contacts the pressure plate fingers. Carefully fill the grease groove inside the bearing hub with lithium base grease (no polyethylene). Clean all excess

grease from the bore of the bearing hub. Excess grease will be forced onto the spline by the transmission input shaft bearing retainer and will contaminate the clutch disc. Also, care must be exercised when applying lubricants to the release bearing, release bearing hub and the release lever fork to avoid excessive grease from contaminating the clutch disc.

Hold the bearing inner race and rotate the outer race while applying pressure to it. If the bearing rotation is rough or noisy, replace the bearing.

Most release bearing failures are caused by improper clutch pedal adjustments. If the clutch linkage does

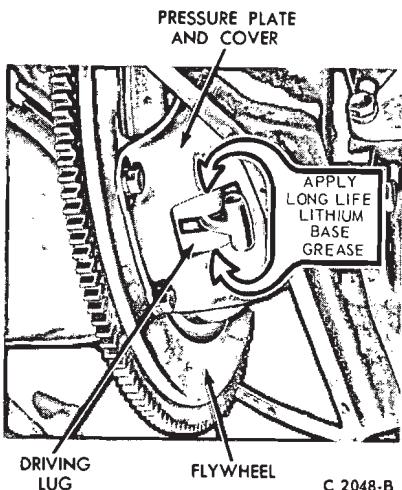


FIG. 8—Pressure Plate Lubrication Points.

not have enough free travel, the release bearing will constantly touch the release fingers and will spin whenever the engine is running.

Release bearing failure can be caused by the release lever contact points being out of plane. Check the wear on the release bearing assembly where the release lever contacts it.

If one side of the assembly shows more wear than the other, the release lever is bent out of plane, or is not centering on the bracket on the flywheel housing.

Misalignment between the engine and transmission can cause release bearing failure. Other symptoms of misalignment are transmission jumping out of gear, especially third gear, drive line vibration; excessive wear in the pilot bushing, excessive clutch disc spin time resulting in gear clash, and excessive transmission gear wear.

PRESSURE PLATE AND COVER

Inspect the surface of the pressure plate for burn marks, scores, or ridges. Generally, pressure plate resurfacing is not recommended. However minor burn marks, scores, or ridges may be removed. During the resurfacing process, the flatness of the pressure plate must be maintained. If the pressure plate is badly heat-checked or deeply scored, replace the pressure plate and cover assembly. Clean pressure plate and flywheel surfaces with a suitable solvent, such as alcohol to be sure the surfaces are free from any oil film. **Do not use cleaners with petroleum base, and do not immerse the pressure plate in the solvent.**

If a substantial difference in finger wear exists, the heavily worn finger is

binding. Replace the pressure plate.

The pressure plate should be lubricated with a lithium-base grease between the driving lugs and the edges of the pressure plate openings as shown in Fig. 8. Depress the pressure plate fingers fully, apply the lubricant, and then move the fingers up and down until the lubricant is worked in. **Do not apply excessive lubricant.**

CLUTCH DISC

Inspect the clutch disc facings for oil or grease. **Eliminate the source of any oil or grease before replacing the disc.** An excessive amount of grease in the pilot bushing or release bearing hub will find its way to the disc facings. Too much lubricant in the transmission or a plugged transmission vent will force the transmission lubricant out the input shaft and onto the disc facings. Also, rear main bearing oil seal leaks or oil leaks from the flywheel mounting bolts can contaminate the clutch disc.

Inspect the clutch disc for worn or loose facings, distortion, loose rivets at the hub, and for broken springs. **Springs loose enough to rattle will not cause noise when the car is operating.** Replace the disc assembly if any of these defects are present. **Be especially careful when installing a new disc to avoid dropping it or contaminating it with oil or grease.**

PILOT BUSHING

Check the fit of the clutch pilot bushing in the bore of the crankshaft.

The bushing is pressed into the crankshaft and should not be loose. Inspect the inner surface of the bushing for wear or a bell-mouunted condition. If the bushing is worn or damaged, replace the bushing with a new service bearing. Refer to the applicable engine for the replacement procedure.

TRANSMISSION

CLEANING

- Wash all parts, except the ball bearings and seals in a suitable cleaning solvent. Brush or scrape all foreign matter from the parts. Be careful not to damage any parts with the scraper. **Do not clean, wash, or soak transmission seals in cleaning solvents.** Dry all parts with compressed air.

- Rotate the ball bearings in a

cleaning solvent until all lubricant is removed. Hold the bearing assembly to prevent it from rotating and dry it with compressed air.

- Lubricate the bearings with approved transmission lubricant and wrap them in a clean, lint-free cloth or paper until ready for use.

- Clean the magnet welded to the bottom of the case with kerosene or mineral spirits.

INSPECTION

- Inspect the transmission case for cracks, worn or damaged bearings bores, damaged threads or any other damage that could affect the operation of the transmission.

- Inspect the front face of the case for small nicks or burrs that could cause misalignment of the transmission with the flywheel housing. Remove all small nicks or burrs with a fine stone.

- Replace a cover that is bent or distorted. Make sure that the vent hole in the cover is open.

- Check the condition of the shift levers, forks, shift rails and the lever and shafts.

- Examine the ball bearing races for cracks, wear or roughness. Inspect the balls for looseness, wear, end play or other damage. Check the bearings for looseness in the bores. If any of these conditions exist, replace the bearings.

- Replace roller bearings that are broken, worn or rough.

- Replace the countershaft (cluster) gear if the teeth are chipped, broken or worn. Replace the countershaft if it is bent, scored or worn.

- Replace the reverse idler gear or sliding gear if the teeth are chipped, worn or broken. Replace the idler gear shaft if bent, worn or scored.

- Replace the input shaft and gear if the splines are damaged or if the teeth are chipped, worn or broken. If the roller bearing surface in the bore of the bear is worn or rough, or if the cone surface is damaged, replace the gear and the gear rollers.

- Replace all other gears that are chipped, broken or worn.

- Check the synchronizer sleeves for free movement on their hubs. Make sure that the alignment marks (etched marks) are properly indexed.

- Inspect the synchronizer blocking rings for widened index slots, rounded clutch teeth and smooth internal surfaces (must have machined grooves). With the blocker ring on the cone, the distance between the face of

the blocker ring and the clutch teeth on the gear must not be less than 0.010 inches.

13. Replace the speedometer drive gear if the teeth are stripped or damaged. Make certain to install the correct size replacement gear.

14. Replace the output shaft if there is any evidence of wear or if any of the splines are damaged.

15. Inspect the bushing and the seal in the extension housing. Replace them if they are worn or damaged. The bushing and/or seal should be re-

placed after the extension housing has been installed on the transmission.

16. Replace the seal in the input shaft bearing retainer.

17. Replace the seals on the cam and shafts.

4 SPECIAL TOOLS

SPECIAL TOOLS

Tool Numbers	Description	Tool Numbers	Description
T50T-100A	Impact Hammer—Long	T61L-7657-A	Transmission Extension Housing Oil Seal Replacer
T59L-100B	Impact Hammer—Short	T57P-7697-B	Extension Housing Bushing Replacer
Tool 1175AB	Grease Seal Remover	T57P-7657-G	Extension Housing Bushing Replacer

CC2135-A

PART 16-02 Clutch

COMPONENT INDEX Applies Only To Models Indicated	Ford	Mercury	Meteor	Cougar	Fairlane	Falcon	Maverick	Montego	Mustang
CLUTCH ASSEMBLY Removal and Installation	02-06	02-06	02-06	02-06	02-06	02-06	02-06	02-06	02-06
CLUTCH ASSIST SPRING Removal and Installation	02-03	02-03	02-03	02-04	02-03	02-03	02-03	02-03	02-04
CLUTCH PEDAL Adjustments	02-01	02-01	02-01	02-01	02-01	02-01	02-01	02-01	02-01
Free Travel	02-01	02-01	02-01	02-01	02-01	02-01	02-01	02-01	02-01
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CLUTCH PEDAL BUSHING Removal and Installation	02-03	02-03	02-03	02-04	02-05	02-05	02-05	02-05	02-04
DESCRIPTION	02-01	02-01	02-01	02-01	02-01	02-01	02-01	02-01	02-01
EQUALIZER BAR Removal and Installation	02-05	02-05	02-05	02-05	02-05	02-05	02-05	02-05	02-05
EQUALIZER BAR BUSHING Removal and Installation	02-05	02-05	02-05	02-05	02-05	02-05	02-05	02-05	02-05

A page number indicates that the item is for the vehicle(s) listed at the head of the column.

N/A indicates that the item is not applicable to the vehicle(s) listed.

1 DESCRIPTION

DESCRIPTION

The clutch is of the centrifugal sin-

gle dry disc type and consists of the clutch disc, pressure plate and the clutch release bearing. On some ve-

hicles the clutch linkages have been changed for 1970.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

CLUTCH PEDAL ADJUSTMENTS

Adjust the clutch pedal free travel whenever the clutch does not disengage properly, or when new clutch parts are installed. Improper adjustment of the clutch pedal is one of the most frequent causes of clutch failure and can be a contributing factor in some transmission failures.

FREE TRAVEL

- Disconnect the clutch return spring from the release lever.
- Loosen the release lever rod locknut and adjusting nut (Figs. 1, 2

and 3).

3. Move the clutch release lever rearward until the release bearing lightly contacts the clutch pressure plate release fingers.

4. Adjust the rod length until the rod seats in the release lever pocket.

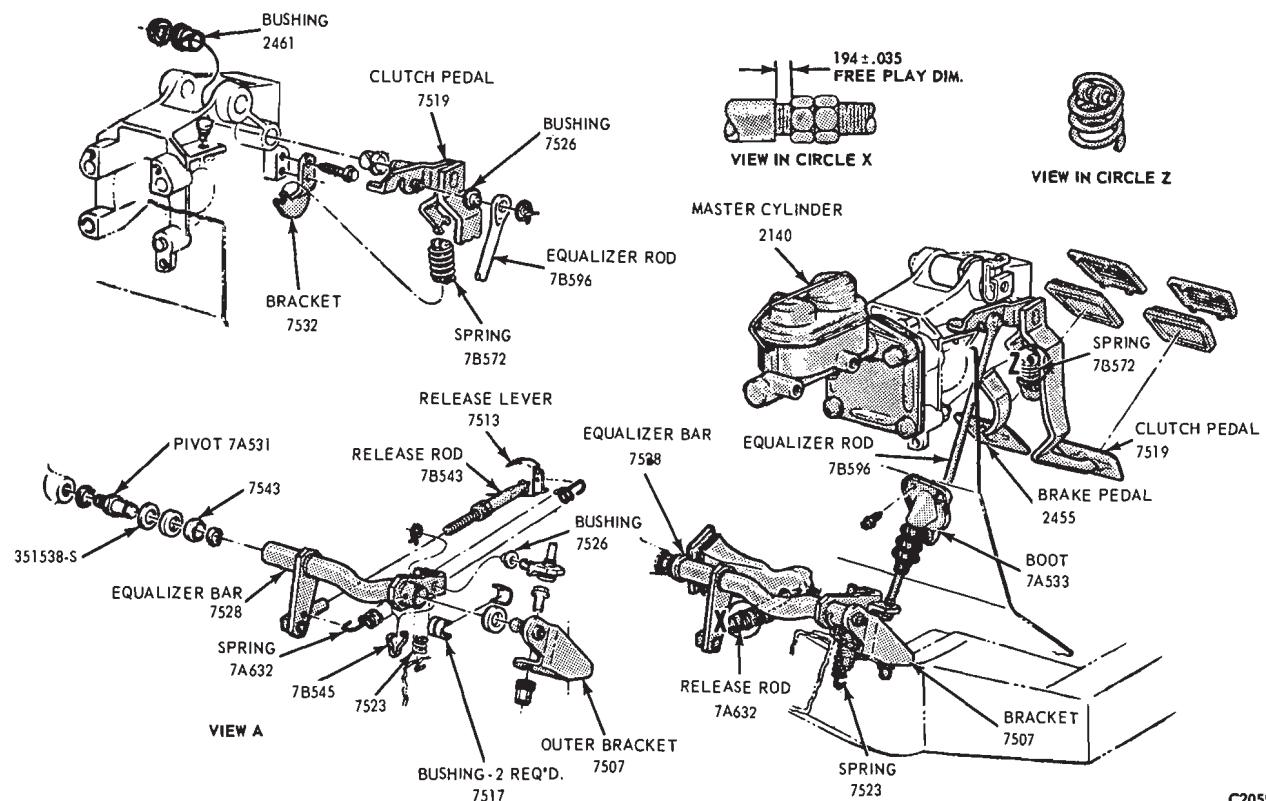
5. Insert the specified feeler gauge between the adjusting nut and the swivel sleeve. Then tighten the adjusting nut against the gauge tight.

6. Tighten the locknut against the adjusting nut, being careful not to disturb the adjustment. Torque the locknut to specification and remove the feeler gauge.

7. Install the clutch return spring.
8. Check the free travel at the

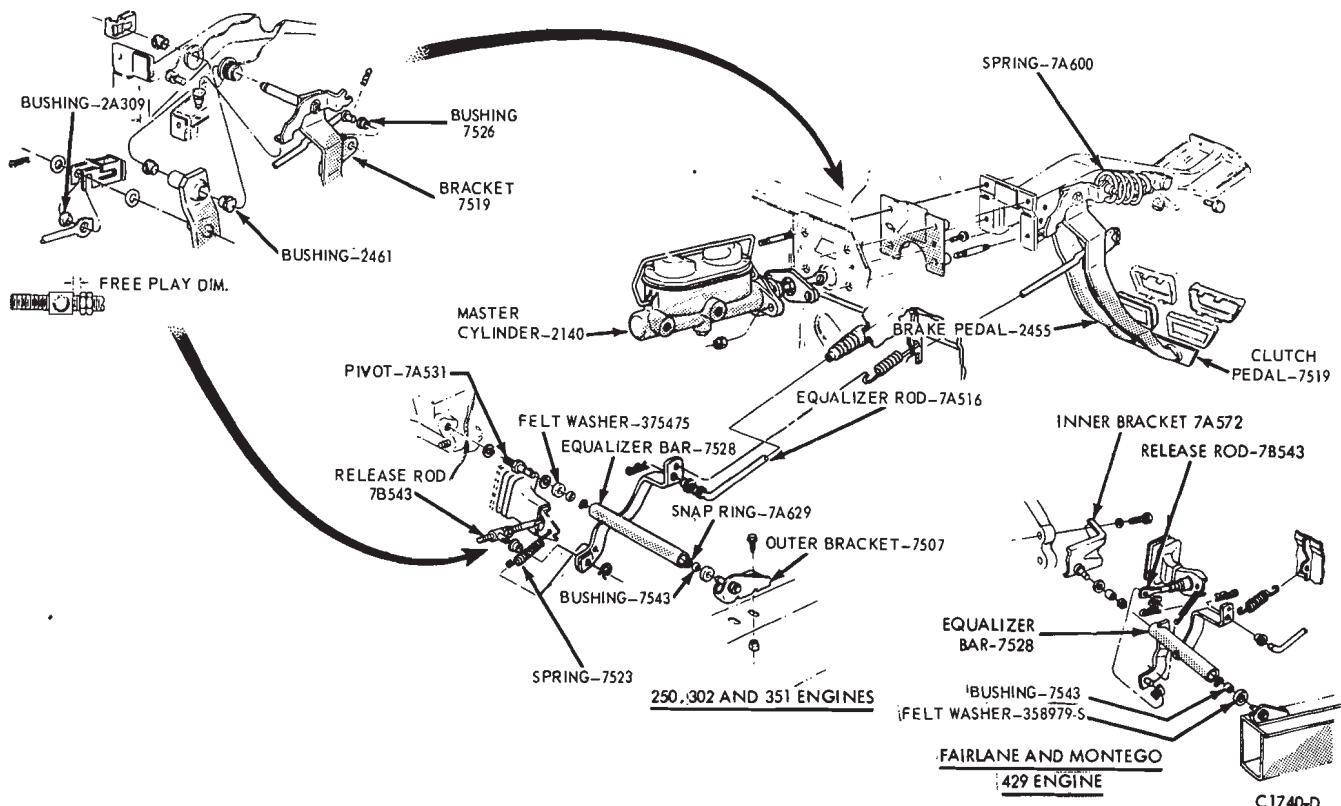
pedal for conformation to specification. Readjust if necessary. Moving the adjusting nut away from the swivel sleeve increases the free travel. Moving the adjusting nut toward the swivel sleeve decreases the free travel.

9. As a final check, measure the pedal free travel with the transmission in neutral and the engine running at about 3000 rpm. If the pedal free travel at this speed is not a minimum of 1/2 inch, readjust the clutch pedal free travel. Otherwise, the release fingers may contact the release bearing continuously, resulting in premature bearing and clutch failure. Free travel must be exactly to specification.



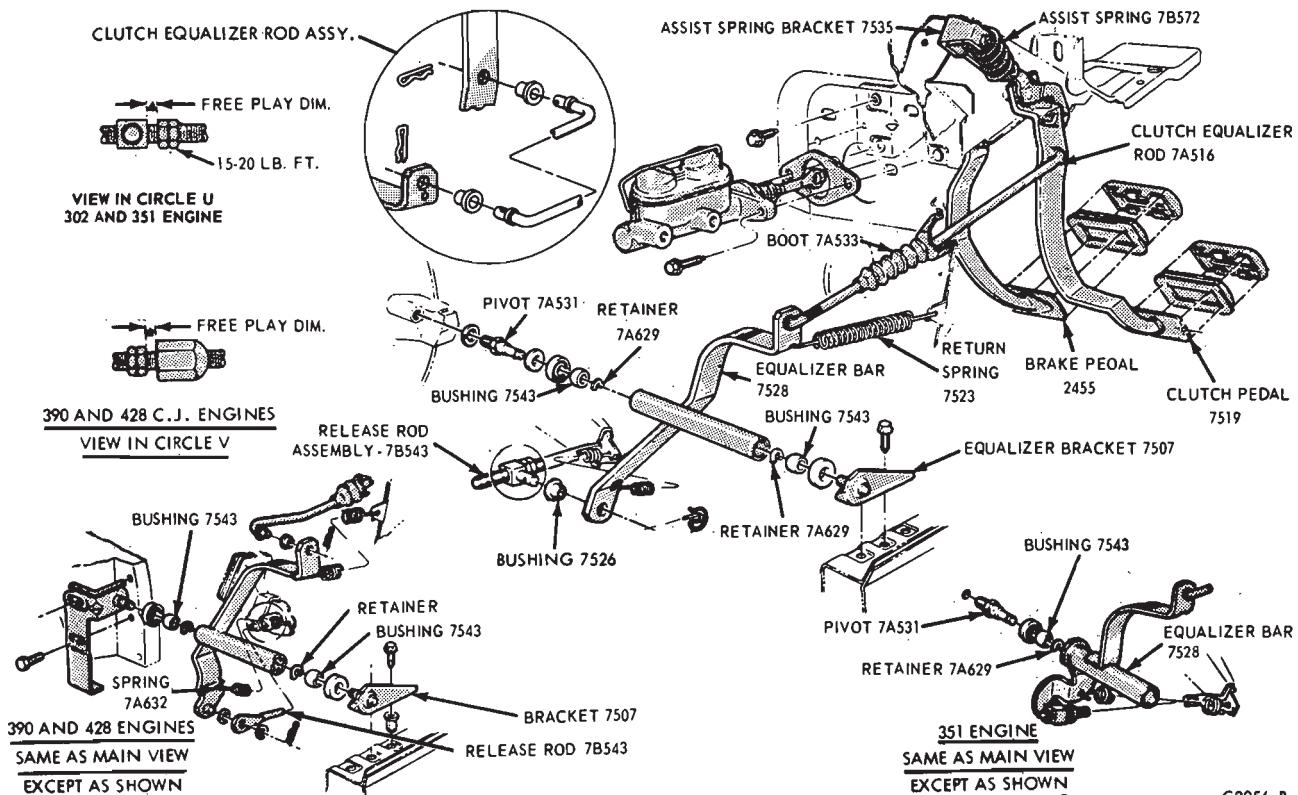
C2055-A

FIG. 1—Clutch Pedal and Linkage Adjustments—Ford, Mercury, Meteor



C1740-D

FIG. 2—Clutch Pedal and Linkage Adjustment—Fairlane, Montego, Maverick and Falcon



C2056-B

FIG. 3—Clutch Pedal and Linkage Adjustment—Mustang, Cougar

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

CLUTCH ASSIST SPRING REMOVAL AND INSTALLATION (FAIRLANE, FALCON, MONTEGO)

1. Remove the cotter pin from the clutch rod at the clutch pedal lever assembly inside the passenger compartment.
2. Grasp the clutch pedal lever firmly to prevent slipping and remove the clutch rod from the lever. Allow the clutch pedal lever to rest on the floor panel.
3. Remove the forward bolt securing the assist spring bracket to the brake pedal bracket and loosen the rear bolt two or three turns. Do not remove the rear bolt.
4. Grasp the assist spring bracket with pliers and rotate upward until the spring can be separated from the bracket.
5. Position the assist spring in the clutch pedal spring bracket and the assist spring bracket. Rotate the spring bracket downward until the

forward bolt holes in the assist spring bracket line up with the holes in the brake pedal bracket (Fig. 4).

6. Install the forward bolt retaining the assist spring bracket to the brake pedal bracket and torque the forward and rear bolts to specification.

7. Install the clutch rod to the clutch pedal lever and insert the outer pin.

CLUTCH PEDAL, PEDAL ASSIST SPRING AND/OR BUSHING REMOVAL AND INSTALLATION

FORD, MERCURY, METEOR

1. Remove the pin that secures the clutch pedal-to-equalizer rod to the clutch pedal.

2. Grasp the clutch pedal lever firmly to prevent slipping and remove the clutch rod from the lever. Allow the clutch pedal lever to rest on the floor.

3. Loosen the lower bolt securing the assist spring bracket to the pedal support bracket two or three turns. Then, remove the upper bolt from the bracket. Do not remove the lower bolt.

4. Grasp the assist spring bracket with pliers and rotate it counterclockwise until the spring is free (Fig. 5).

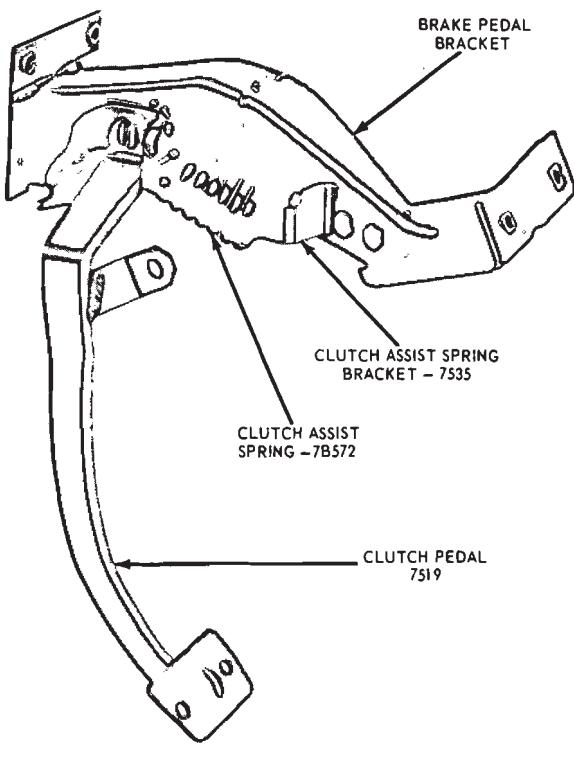
5. Remove the retaining ring from the end of the clutch pedal shaft. Then remove the shaft, bushings and clutch pedal from the support.

6. Remove the bushings from the pedal shaft and pedal support and transfer the rubber pedal pad.

7. After lubricating the pedal shaft bushings, position the clutch pedal and bushings in the pedal support.

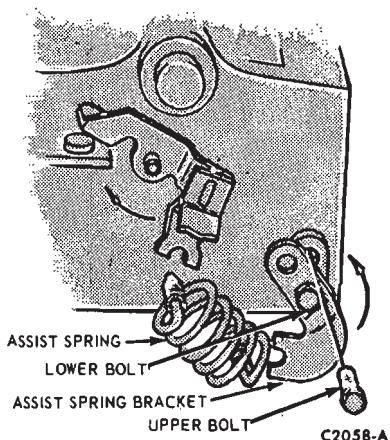
8. Install the retaining ring on the clutch pedal shaft.

9. Position the assist spring in the pedal support bracket and the assist spring bracket. Rotate the assist spring bracket clockwise until the upper bolt holes line up and install



C 1769-B

FIG. 4—Clutch Pedal Assembly—Fairlane, Montego, Maverick and Falcon



C2058-A

FIG. 5—Removing Clutch Assist Spring—Ford, Mercury and Meteor

the bolt. Torque both the upper and lower bolts to specification.

10. Check the clutch pedal free travel and adjust as required.

MUSTANG, COUGAR

1. Disconnect the battery ground cable.

2. Remove the steering column. Refer to Group 3 of this manual for the procedure.

3. Remove the two capscrews retaining the master cylinder or booster to the dash panel. Then remove the two capscrews retaining the pedal support bracket to the dash panel.

4. Working inside the vehicle, disconnect the clutch pedal-to-equalizer rod at the clutch pedal by removing the retainer and bushing.

5. Secure the clutch pedal against the bumper stop with a small C-clamp as shown in Fig. 6.

6. Disconnect the stop light switch wires at the connector.

7. Remove the switch retainer and slide the stop light switch off the brake pedal pin just far enough for the switch outer hole to clear the pin. Then lower the switch away from the pin. Remove the master cylinder push rod, bushing and nylon washer from the brake pedal pin.

8. Remove the screw retaining the pedal support bracket to the top inner cowl bracket (Fig. 6).

9. Remove the two sheet metal screws retaining the pedal support bracket to the dash panel.

10. Remove the two screws retaining the pedal support bracket to the upper cowl brace and lower the pedal support bracket away from the steering column studs.

11. Remove the pedal support bracket assembly from the vehicle.

12. Mount the bracket in a vise.

13. Remove the small C-clamp securing the clutch pedal to the bumper. Slowly pivot the pedal away from the bumper until the assist spring can be lifted from its seat.

14. Remove the retainer clip from the clutch and brake pedal shaft. Then, remove the clutch pedal and shaft assembly, brake pedal assembly, and bushings from the pedal support bracket.

15. Apply a coating of SAE 10 engine oil to the bushings and locate all bushings in their proper places on the brake and clutch pedal assemblies.

16. Position the brake pedal to the pedal support bracket. Install the clutch and brake pedal shaft through the pedal support and brake pedal assembly. Install the retainer.

17. Install the clutch pedal assist spring and pivot the pedal against its bumper stop. Secure the pedal against the bumper with a small C-clamp as shown in Fig. 6.

18. Position the pedal support bracket assembly to the dash panel and to the steering column retainer studs.

19. Align the pedal support bracket holes with the holes in the dash panel and install the two sheet metal screws.

20. Install the two capscrews attaching the pedal support bracket to the upper cowl bracket.

21. Install the screw attaching the support bracket to the top inner cowl bracket (Fig. 6).

22. Install the inner nylon washer, bushing master cylinder push rod on the brake pedal pin. Position the stop light switch so that it straddles the

push rod with the switch slot on the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the outer nylon washer. Secure with the self-locking pin.

23. Connect the stop light switch wires to the connector and install the wires to the retaining clip.

24. Connect the clutch pedal-to-equalizer rod to the clutch pedal assembly with the bushing and retainer and remove the C-clamp from the bracket.

25. Working from the engine side of the dash panel, install the two cap-screws attaching the pedal support bracket to the dash panel. Then install the two screws attaching the master cylinder to the dash panel.

26. Install the steering column. Refer to Group 13 of this manual for the procedure.

27. Adjust the clutch pedal free travel.

28. Check the brake pedal free height and travel measurements.

29. Connect the battery ground cable.

CLUTCH PEDAL AND/OR BUSHING REMOVAL AND INSTALLATION

MONTEGO, FALCON FAIRLANE

1. Remove the retaining clip (Fig. 2) that secures the equalizer rod to

the clutch pedal. Disconnect the rod from the pedal.

2. Remove the lower bolt retaining the assist spring bracket to the pedal support. Then, loosen the upper bracket retaining bolt (approximately 4 turns) and disconnect the spring from the clutch pedal and bracket.

3. Disconnect the brake pedal push rod from the brake pedal.

4. Remove the bolt that secures the left air vent control cable bracket to the instrument panel. Position the control cable to one side.

5. Remove the retaining clip and flat washer from the clutch pedal shaft. Then, remove the shaft, bushing, clutch pedal and brake pedal from the support.

6. Remove the bushings from the pedal shaft, and transfer the pedal pad.

7. Lubricate the clutch pedal shaft bushings and position them on the shaft. Then, position the brake pedal and clutch pedal in the pedal support.

8. Install the flat washer and retaining clip on the pedal shaft.

9. Position the assist spring to the pedal and bracket. Pry the bracket forward and install the lower bolt. Torque the bolts to specifications.

10. Position the master cylinder push rod, bushing, and washers on the brake pedal and secure with a retaining clip.

11. Connect the equalizer rod to the clutch pedal and secure it in place with a retaining clip.

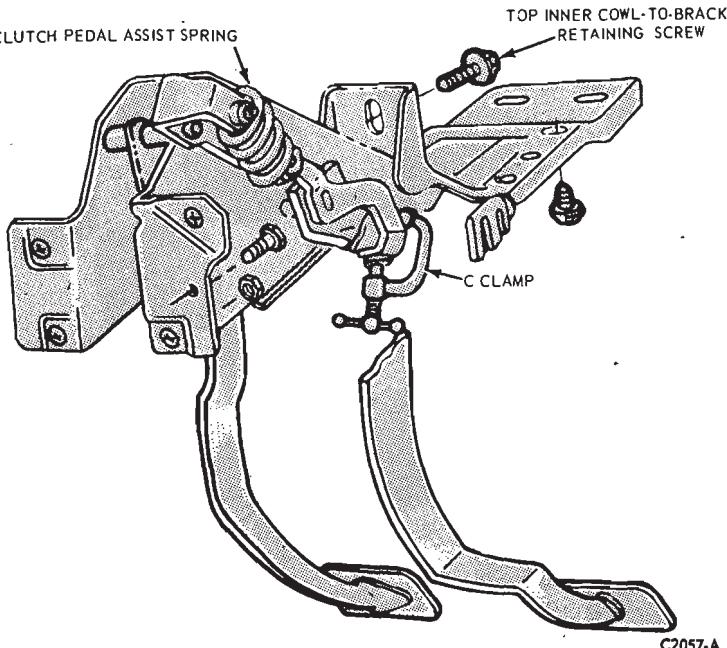


FIG. 6—Clutch Pedal—Mustang and Cougar

12. Position the air vent control cable bracket to the instrument panel and secure with the attaching bolt.

13. Adjust the clutch pedal free travel.

EQUALIZER BAR AND/OR BUSHING REMOVAL AND INSTALLATION

FORD, MERCURY AND METEOR

1. Raise the vehicle and disconnect the clutch pedal-to-equalizer rod at the equalizer bar (Fig. 1).

2. Disconnect the return spring and retaining spring at the release lever. Separate the release lever rod from the release lever.

3. Remove the equalizer bar frame bracket from the frame.

4. Remove the equalizer bar from the pivot on the flywheel housing.

5. Remove the wire clip to replace the outer bushing and the snap ring from the inner pivot stud to replace the inner bushing.

6. Position the bushing on the inner and outer pivots, and lubricate the bushing with lithium base grease. Position, and secure the flat washer and felt washer with the snap ring.

7. Lubricate the bore of the equalizer bar with lithium base grease. Position the equalizer bar on the inner pivot and bolt the equalizer bar frame bracket to the frame. Torque the attaching bolts to specification.

8. Install the clutch release rod, return spring and retaining spring.

9. Connect the clutch pedal rod to the equalizer bar.

10. Adjust the clutch pedal free travel.

MUSTANG, COUGAR, MONTEGO, FALCON, MAVERICK, FAIRLANE(EXCEPT MONTEGO AND FAIRLANE WITH 390 V-8)

1. Disconnect the clutch pedal equalizer rod at the equalizer bar and disconnect the clutch retracting spring (Figs. 2 and 3).

2. Raise the vehicle and disconnect the release lever, return spring at the lever.

3. Remove the equalizer bar outer bracket and bushing assembly.

4. Remove the release rod from the equalizer bar, and then remove the equalizer bar. Remove the bushing and washers from the inner mounting stud.

5. Lubricate both ends of the equalizer bar tubes with lithium base grease.

6. Position the equalizer bar, wash-

ers., inner bushing, and retainer on the inner stud.

7. After positioning the outer bushing, install the outer bracket (with the equalizer bar in place).

8. Connect the release rod and the release lever return spring.

9. Lower the vehicle. Connect the clutch pedal equalizer rod to the equalizer bar and secure with the retaining pin.

10. Adjust the clutch pedal free travel as required.

MONTEGO AND FAIRLANE—390 V-8

1. Disconnect the clutch pedal equalizer rod at the equalizer bar, and disconnect the clutch retracting spring. (Fig. 2).

2. Raise the vehicle and disconnect the return spring at the release lever. Disconnect the release lever rod from the equalizer lever.

3. Remove the equalizer bar center bolt.

4. Separate the equalizer bar and remove both sections from the vehicle.

5. Remove the bolts retaining the equalizer bar inner bracket to the flywheel housing and remove the bracket and bushing assembly.

6. Remove the equalizer bar outer bracket and bushing assembly.

7. Remove the snap ring, bushing, and felt washer from each bracket assembly.

8. Position a felt washer, and bushing on each bracket assembly and secure with the snap ring.

9. Install the outer bracket and bushing assembly to the frame (Fig. 2). Torque the bracket attaching bolts to specifications.

10. Lubricate both ends of the equalizer bar tubes.

11. Position the outer section of the equalizer bar on the outer bracket

pivot.

12. Connect the two sections of the equalizer bar. Insert the inner bracket pivot into the equalizer bar and install the assembly to the flywheel housing. Torque the attaching bolts to specifications.

13. Install the equalizer bar center bolt and torque to specifications. Make sure that both ends of the equalizer bar are against the felt washers.

14. Connect the release rod and the release lever return spring.

15. Adjust the clutch pedal free travel.

16. Lower the vehicle. Connect the clutch pedal equalizer rod to the equalizer bar and secure with the retaining clip. Connect the retracting spring between the dash panel and the equalizer bar upper lever.

17. Check the free travel at the pedal for conformance to specifications. Readjust if necessary.

3 REMOVAL AND INSTALLATION

CLUTCH REMOVAL

1. Raise the vehicle on a hoist.

2. Disconnect the drive shaft from the rear U-joint flange. Then, slide the drive shaft off the transmission output shaft. Insert the appropriate tool over the output shaft and into the extension housing oil seal.

3. Disconnect the speedometer cable from the extension housing.

4. Disconnect the gear shift rods from the transmission. If the vehicle is equipped with a four-speed transmission, remove the bolts that secure the four-speed transmission, disconnect the front brake cable from the crossmember and remove the crossmember from the vehicle.

5. Remove the bolts that attach the transmission to the flywheel housing.

6. Move the transmission rearward until the input shaft clears the flywheel housing, then remove it from the vehicle.

7. Disconnect the clutch release lever retaining spring from the release lever.

8. Remove the starter cable then remove the starter motor from the flywheel housing.

9. Remove the bolts that secure the engine rear plate to the front lower part of the flywheel housing.

10. Remove the flywheel housing lower cover (390 CID housing only).

11. Remove the bolts that attach the housing to the cylinder block.

12. Move the housing back just far enough to clear the pressure plate, then move it to the right to free the pivot from the clutch equalizer bar. Be careful not to disturb the linkage and assist spring.

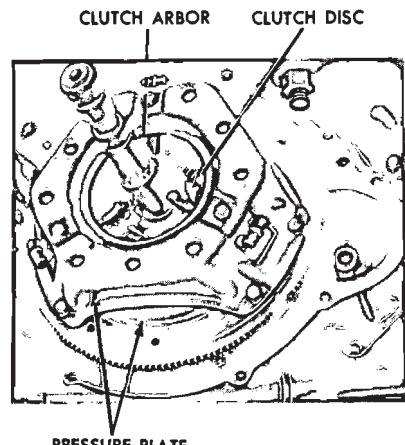
13. Loosen the six pressure plate cover attaching bolts evenly to release the spring tension and avoid distortion of the cover. If the same pressure plate and cover is to be installed after the clutch is overhauled, mark the cover and flywheel so that the pressure plate can be installed in the same position.

14. Remove the pressure plate and the clutch disc from the flywheel.

CLUTCH INSTALLATION

1. Install the clutch release lever if it was removed.

2. Place the clutch disc, and pressure plate assembly in position on the flywheel. Start the cover attaching bolts to hold the pieces in place, but do not tighten them. Avoid touching the clutch disc facing, dropping the parts or contaminating them with oil or grease as clutch chatter may result.



C 1788-A

FIG. 7 — Installing Clutch Disc—Typical

3. Align the clutch disc with the tool shown in Fig. 7, and alternately tighten the bolts a few turns at a time until they are all tight. Then torque the six pressure plate cover attaching bolts to specification before removing the tool.

4. Apply a light film of grease (C3VY-19586-A) to the outside diameter of the transmission front bearing retainer. Apply a light film of grease (C3VY-19586-A) to both sides of the

release lever fork where it contacts the release bearing bore spring clips. Apply a light film of grease to the release bearing surface that contacts the pressure plate release fingers. Fill the grease groove of the release bearing hub with lithium base grease (C3VY-19586-A). Clean all excess grease from inside the bore of bearing hub. Excess grease will be forced onto the spline by the transmission input shaft bearing retainer and will contaminate the clutch disc. Also, place the release bearing and hub on the release lever.

5. Make certain that the flywheel housing and the cylinder block mounting surfaces are clean. Position the felt washer on the pivot in the flywheel housing. Slip the pivot into the clutch equalizer shaft being careful not to disturb the linkage and at the same time position the housing on the

dowels in the cylinder block. Install and alternately torque the attaching bolts to specification.

6. Install the starting motor and connect the cable.

7. The mounting surfaces of the transmission and the flywheel housing must be free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until it is tightly positioned against the flywheel housing.

8. Install the two upper mounting bolts. Then, remove the guide pins and install the two lower mounting bolts. Torque all the bolts to specification.

9. Raise the rear of the engine and install the crossmember. Install and torque the crossmember attaching bolts to specifications, then lower the

engine.

10. Install the extension housing-to-engine rear support attaching bolts. Torque the bolts to specification.

11. Remove the transmission jack and connect the parking brake cable.

12. If the vehicle is equipped with a four-speed transmission, connect the gear shift linkage control bracket to the extension housing.

13. Connect the gear shift rods to the transmission. Adjust the shift linkage as required.

14. Connect the release lever retaining spring. Install the flywheel housing cover (390 CID housing only).

15. Remove the tool from the transmission output shaft and install the drive shaft.

16. Check the clutch pedal free travel.

4 SPECIFICATIONS

CLUTCH IDENTIFICATION

Car Line	Engine	Transmission	Pressure Plate			Disc		
			Diameter (Inches)	No. of Springs	Color Identification (Paint Daub)	Diameter (Inches)	No. of Springs	Color Identification (Paint Daub)
Mustang	200-1V	3-Speed	9	6	Pressure Plate-Orange Cover-Purple Springs-Aluminum Stripe	9	6	Clutch-Pink Springs-Blue
Fairlane Montego Mustang	250-1V		10		Pressure Plate-2 Green Daubs Cover- Pink Springs-Red	10	10	Clutch-White Springs-Orange
Fairlane Montego Mustang Cougar	302-2V	3-Speed 4-Speed	10	9	Pressure Plate- 2 Green Daubs Cover-White Springs-Bronze	10	12	Clutch-Blue Springs-6 Pink 6 Orange
Mustang Cougar	302-4V H.O.	4-Speed	10.4		Pressure Plate-Brown Cover-2 White Daubs Springs-2 White Stripes	10.4	8	Clutch-Orange Springs-Gray
Fairlane Montego Mustang Cougar	351-2V, 4V	3-Speed 4-Speed	11		Pressure Plate- 2-Blue Daubs Cover-Yellow Springs-Silver	11		Clutch-Pink and Orange Springs-Aluminum
Fairlane Montego	429-4V CJ	4-Speed	11.5	12	Pressure Plate- White and Bronze Cover-Purple Springs-Green	11.5	10	Clutch-Gray Springs-Red Stripe
Mustang Cougar	428-CJ	4-Speed	11.5	12	Pressure Plate- White and Bronze Cover-Purple Springs-Green	11.5	10	Clutch-Gray Springs-Red Stripe
Ford Meteor	240-1V	3-Speed	9.5	6	Pressure Plate-None Cover Green Springs-Aluminum	9.5	6	Clutch-Yellow Springs-4 Aluminum (Large) 2 Purple (Small)
Ford Meteor	240 HD 302 HO		11.0	9	Pressure Plate-2 White Daubs Cover-Pink and Blue Springs-Green	11.0	8	Clutch-None Springs-4 Aluminum 4 Pink
Ford Meteor	302		10.0		Pressure Plate-2 Green Daubs Cover-White Springs-Bronze-1 White Stripe	10	12	Clutch-Blue Springs-6 Pink (Large) 6 Orange (Small)
Ford Mercury Meteor	390	3-Speed	11.0		Pressure Plate-2 Blue Daubs Cover-Yellow Springs-Aluminum	11.0	12	Clutch-Pink Springs-6 Orange (Large) 6 Green (Small)
Ford Meteor	351	3-Speed			Pressure Plate-2 Blue Daubs Cover-Yellow Springs-Aluminum			Clutch-Pink Springs-6 Green (Small) 6 Orange (Large)

TORQUE LIMITS (FT-LBS)

Description	Meteor Ford, Mercury	Mustang, Cougar Fairlane, Montego, Falcon
Lower Access Clutch Cover Pan to Flywheel Housing Bolts (Cast Iron Housing)	17-20	—
Transmission Assembly to Flywheel Housing Bolts	37-42	—
Pressure Plate and Cover Assembly to Flywheel Attaching Bolts	12-20	12-20
Clutch Release Equalizer Frame Bracket Bolts	15-24	15-24
Clutch Pedal Free Travel Adjustment Nut	15-20	15-20
Flywheel Housing to Cylinder Block Bolts 6-Cylinder 8-Cylinder	— —	23-33 40-50
Clutch Pedal Assist Spring Bracket to Brake Pedal Support Bracket	12-17	12-17

CC2137-A

SPECIAL TOOLS

Tool Number	Description
Tool-4201-C	Clutch Housing-Bore and face alignment check

CC1239-A

CLUTCH- ADJUSTMENTS (INCHES)

Release Lever Rod Adjusting Nut to Swivel Sleeve Ford, Mercury Meteor Fairlane, Montego, Falcon, Mustang, Cougar ex. with 390, 428 engine 390, 428 Engines	0.194 0.136 0.178
Clutch Pedal Free Travel (Engine Running)	7/8"-1 1/8"

CC2138-A

PART 16-03 Ford Design Three-Speed Transmission

COMPONENT INDEX Applies Only To Models Indicated	Ford	Mercury	Meteor	Cougar	Fairlane	Falcon	Maverick	Montego	Mustang
COUNTERSHAFT GEAR BEARINGS Parts Repair and Replacement	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07
DESCRIPTION	03-01	03-01	03-01	03-01	03-01	03-01	03-01	03-01	03-01
GEAR SHIFT LEVER Removal and Installation	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07
GEARSHIFT LEVER CONTROL ASSEMBLY Disassembly and Overhaul	N/A	N/A	N/A	03-08	N/A	N/A	N/A	N/A	03-08
Removal and Installation	N/A	N/A	N/A	03-03	N/A	N/A	N/A	N/A	03-03
GEAR SHIFT LINKAGE Adjustment-Column Mounted	03-02	03-02	03-02	N/A	03-02	03-02	03-02	03-02	N/A
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LOCK ROD Adjustment	N/A	N/A	N/A	03-03	N/A	N/A	N/A	N/A	03-03
Removal and Installation	N/A	N/A	N/A	03-03	N/A	N/A	N/A	N/A	03-03
SHIFT LEVERS Disassembly and Overhaul	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07
Parts Repair or Replacement	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07
SHIFT LEVER SEALS Parts Repair or Replacement	03-07								
SHIFT LINKAGE GROMMET (COLUMN MOUNTED) Removal and Installation	03-03	03-03	03-03	N/A	03-03	03-03	03-03	03-03	N/A
SYNCHRONIZERS Disassembly and Overhaul	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07	03-07
TRANSMISSION COMPLETE Cleaning and Inspection (See Part 16-01) Description	03-01	03-01	03-01	03-01	03-01	03-01	03-01	03-01	03-01
Removal and Installation	03-04	03-04	03-04	03-04	03-04	03-04	03-04	03-04	03-04
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A page number indicates that the item is for the vehicle(s) listed at the head of the column.									
N/A indicates that the item is not applicable to the vehicle(s) listed.									

1 DESCRIPTION

DESCRIPTION

The RAN and RAT Model three-speed transmissions (Fig. 1) are used

on models having 170, 200, 240, 250, (RAN) and 302, 351 and 390 (RAT) C.I.D. engines. The specifications of this section, Part 16-05, lists the

transmission model numbers and vehicles in which they are used.

A transmission service identification tag is located on the right side of

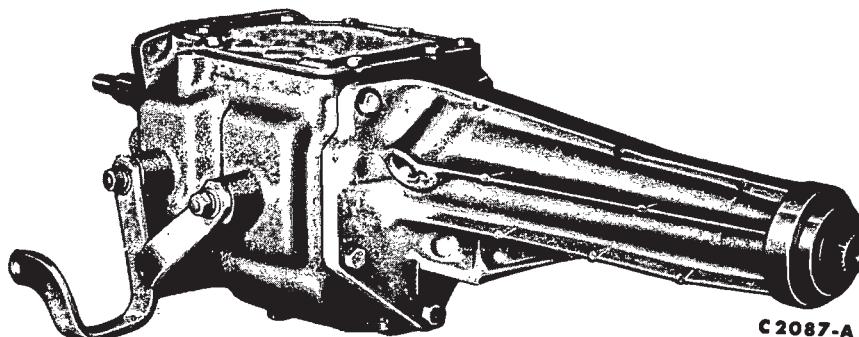


FIG. 1—Three-Speed Transmission—Typical (Column Shift)

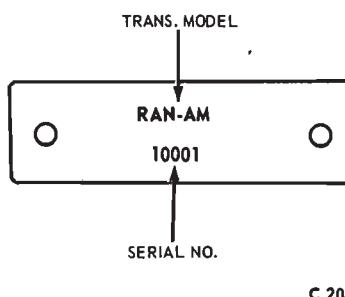


FIG. 2—Transmission Identification Tag

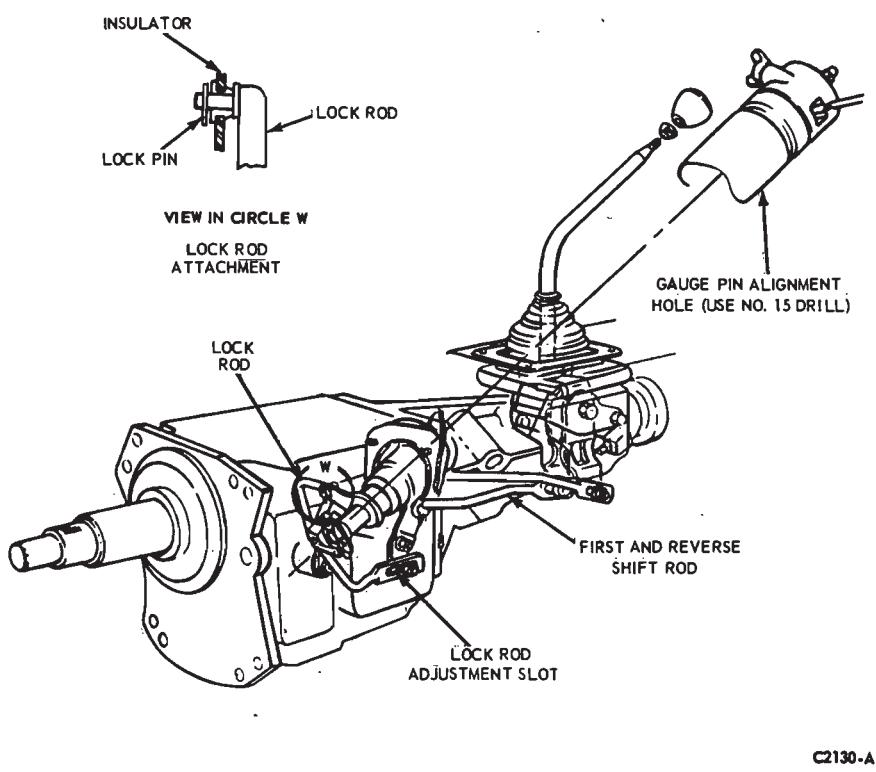


FIG. 3—Three Speed Floor Shift Lock Rod Installation

the case at the front (Fig. 2). The first line on the tag will show the transmission model and service identification code when required. The second line will show the transmission serial number. Additionally, a serial number is stamped on the top side of the flange on the case for further identification.

This transmission is of the fully synchronized type, with all gears except the reverse gear and sleeve being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves.

The forward-speed gears are helical-cut and are in constant mesh. Gears used in the reverse gear train are spur-cut and are not synchronized.

New shift rails provide a shorter shift travel. Floor shift models have a new design reverse lever. This permits use of an additional control rod for locking the transmission in reverse through the steering column (Fig. 3). With the shorter shift travel, the shift levers at the side of the transmission have been redesigned to maintain acceptable shift efforts.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT—COLUMN MOUNTED

1. Place the gear shift lever in the neutral position.
2. Loosen the two gear shift rod adjustment nuts.
3. Check shift levers on transmission to be in neutral position.

4. Insert a 3/16-inch diameter alignment tool through the first and reverse gear shift lever, the second and third gear shift lever and both holes in the lower casting (Fig. 4). An alignment tool can be made from 3/16 inch drill rod bent to an L shape. The extensions should be 1 inch and 2 inches from the elbow.

The short end of the tool should be inserted into the alignment holes.

5. Tighten the two gear shift rod adjustment nuts.
6. Remove the alignment tool from the levers.
7. Start the engine and shift the selector lever to each position to make sure it operates freely.

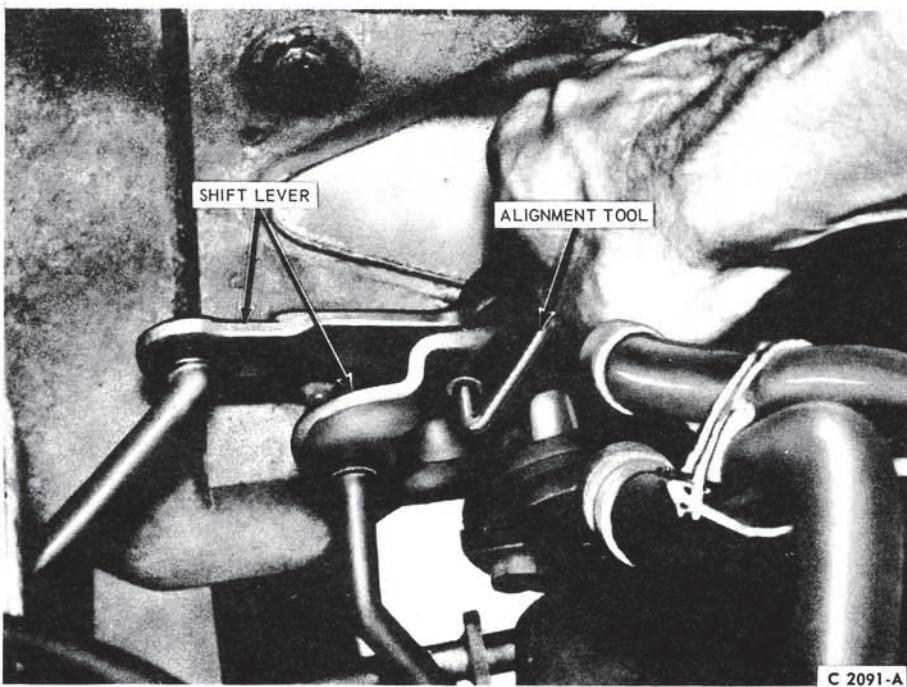


FIG. 4—Gearshift Linkage Adjustment—Typical

GEAR SHIFT LINKAGE ADJUSTMENT—FLOOR MOUNTED

1. Loosen the three shift linkage adjustment nuts. Install a 1/4 inch diameter alignment pin of suitable length and shape through the control bracket and lever alignment holes.
2. Tighten the three linkage adjustment nuts and then remove the alignment pin.
3. Check the gear shift lever for a smooth crossover.

GEAR SHIFT LEVER CONTROL ASSEMBLY REMOVAL AND INSTALLATION—FLOOR-MOUNTED

1. Remove the four screws attaching the lower boot to the floor pan.
2. Remove the two bolts attaching the gear shift lever to the control assembly.
3. Remove the two piece lock nuts that connect the shift rods to the control assembly.
4. Remove the three bolts retaining the shift control assembly to the extension housing. Allow the back-up light switch to hang free.
5. Lower the control assembly from the vehicle and remove the boot.
6. Slide the control assembly into the boot and attach the entire assembly to the extension housing. Do not lose the spacer located inside the assembly. Be sure the back-up light switch is properly installed.
7. Install the two bolts securing the gear shift lever to the shift control as-

sembly.

8. Insert a 1/4 inch diameter alignment pin in the alignment holes of the control assembly.
9. Position the shift rods on the selector levers and install the lock nuts.
10. Remove the alignment pin.
11. Check the operation of the shift mechanism for smooth crossover and adjust as required.

LOCK ROD

The floor shift lock mechanism is a control rod connecting the lower steering column shift tube to the manual transmission reverse lever.

LOCK ROD ADJUSTMENT

Adjustment can be correctly made only when the shift control alignment is right.

1. Position the hand shift lever in neutral.
2. Align the hole in the steering column socket casting with the column alignment mark and insert a .180 diameter (No. 15) drill (rod). The column casting must not rotate with the drill (rod) in position (Fig. 3).
3. Tighten the adjustment nut to specified torque.
4. Check for proper operation.

LOCK ROD REMOVAL

1. Disconnect the rod at transmis-

sion lever.

2. Snap the rod out of the grommet located in the lever attached to the steering column shift tube. On Mustang and Cougar, the retaining clip must be removed first.
3. Remove the rod.

LOCK ROD INSTALLATION

1. Install the rod in the grommet at the steering column lever. On Mustang and Cougar, install the retaining clip.
2. Secure the rod to the transmission connection (slotted adjustment end) loosely to allow movement in slot for final adjustment.

COLUMN—MOUNTED SHIFT LINKAGE GROMMET REMOVAL AND INSTALLATION

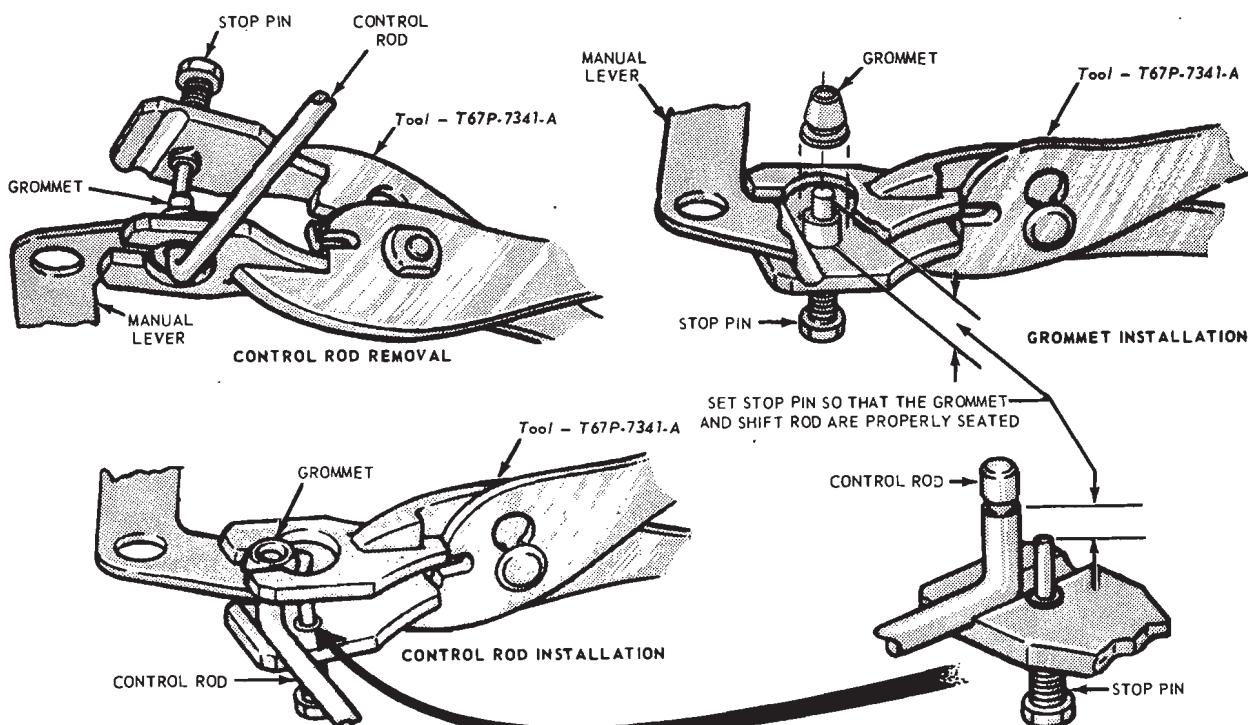
The column-mounted shift lever assembly incorporates an oil impregnated plastic grommet in the end of each lever arm. A special tool T67P-7341-A is required to install the grommet in the shift lever, and to install the shift linkage rod into the grommet. Remove and install the grommet as follows:

1. Place the lower jaw of the tool between the shift lever and the shift rod. Position the stop pin against the end of the shift rod (Fig. 5) and force the rod out of the grommet. Remove the grommet from the shift lever by cutting off the large shoulder with a sharp knife. **The grommet must be removed from the shift lever and a new one installed each time the rod is disconnected.**

2. Before installing a new grommet, adjust the stop pin as necessary to properly install the grommet and coat the outside of the grommet with lubricant. Then, place the grommet on the stop pin and force it into the shift lever hole. Turn the grommet several times to be sure it is properly seated.

3. Readjust the stop pin to a length which is sufficient to install the shift rod into the grommet (Fig. 5). If the pin height is not adjusted, the shift rod may be pushed too far through the grommet causing damage to the grommet retaining lip.

4. With the pin height properly adjusted, position the shift rod on the tool and force the rod into the grommet until the groove in the rod seats on the inner retaining lip of the grommet.



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FIG. 5—Removing or Installing Shift Linkage Grommet

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the vehicle on a hoist.
2. Mark the drive shaft so that it may be installed in the same relative position. Disconnect the drive shaft from the rear U-joint flange.
3. Slide the front of the drive shaft out of the transmission extension housing and off the output shaft. Insert the tool shown in Fig. 5, Part 16-01 into the extension housing to prevent the lubricant from leaking out of the transmission.
4. Remove the cap screw and lock washer that secures the speedometer cable retainer to the extension housing. Pull the speedometer cable out of the extension housing.
5. On vehicles equipped with a column-mounted gear shift selector, remove the shift rods from the shift levers at the transmission. On vehicles equipped with a floor-mounted gear shift selector, remove the shift selector assembly from the extension hous-

ing.

6. On Ford, Mercury and Meteor vehicles disconnect the parking brake cable from the equalizer lever and separate the lever from the crossmember.
 7. On Ford, Mercury and Meteor models, remove the bolts that secure the extension housing to the engine rear support.
 8. Raise the rear of the engine high enough to remove the weight from the crossmember.
 9. Support the transmission with a transmission jack and remove the transmission from the flywheel housing.
 10. Move the transmission and jack rearward until the input shaft is clear of the flywheel housing.
 11. Remove the transmission from the jack and mount it in a holding fixture.
- Do not depress the clutch pedal while the transmission is removed.**

INSTALLATION

1. Make certain that the machined surfaces of the transmission case and the flywheel housing are free of dirt, paint, and burrs.
2. Install a guide pin in each lower mounting bolt hole.
3. Start the input shaft through the release bearing. Align the splines on the input shaft with the splines in the clutch disc. Move the transmission forward on the guide pins until the input shaft pilot enters the bearing or bushing in the crankshaft. If the transmission front bearing retainer binds up on the clutch release bearing hub, work the release bearing lever until the hub slides onto the transmission front bearing retainer. Install the two transmission-to-flywheel housing upper mounting bolts and lockwashers. Remove the two guide pins and install the lower mounting bolts and lock washers.
4. Raise the rear of the engine high

enough to provide clearance for installing the crossmember. Bolt the crossmember assembly to the frame side supports.

5. On Ford, Mercury and Meteor models, lower the engine until the extension housing just contacts the rear support. Align the bolt holes in the extension housing with those in the support. Then lower the engine and remove the jack. Install the two extension housing-to-support attaching bolts and lock washers.

6. On Ford, Mercury and Meteor models, insert the parking brake front

cable in the equalizer and install the equalizer in the bracket on the crossmember. Secure the parking brake rear cable to the equalizer.

7. On vehicles equipped with a column-mounted gear shift selector, secure the shift rods to the shift levers at the transmission. On vehicles equipped with a floor-mounted gear shift selector, attach the shift selector assembly to the extension housing.

8. Insert the speedometer cable and driven gear in the extension housing and secure it with a cap screw and lock washer.

9. Remove the tool shown in Fig. 5, Part 16-01, from the extension housing. Align the reference marks and slide the front universal joint yoke onto the output shaft and into the extension housing. Connect the rear universal joint to the axle pinion flange and torque the nuts to specifications.

10. Fill the transmission to the proper level with the approved lubricant.

11. Adjust the clutch pedal free travel and the shift linkage as required.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant by removing the drain plug, if so equipped, or the lower extension housing bolt.

2. Remove the cap screws that attach the cover to the case. Remove the cover and the gasket (Fig. 6) from the case.

3. Remove a long spring that retains the detent plug in the case (Fig. 9). Remove the detent plug with a small magnet.

4. Remove the cap screws and lock washers that attach the extension housing to the case. Remove extension and gasket from the case.

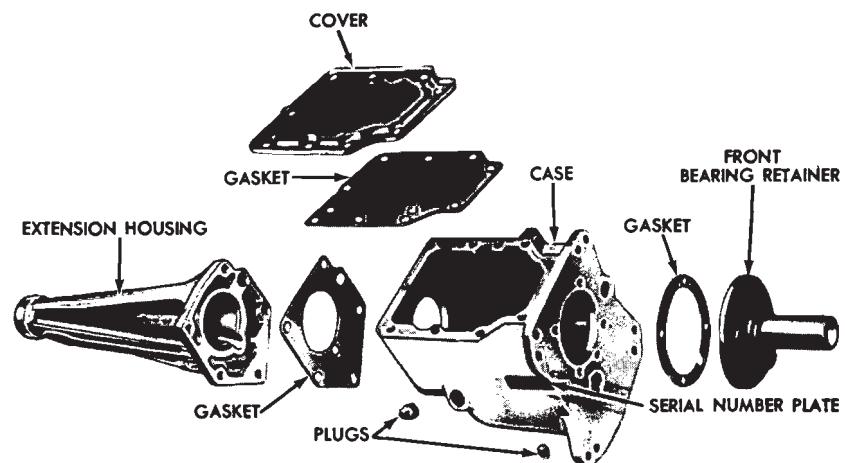
5. Remove the cap screws and lock washers that attach the front bearing retainer to the case. Remove the front bearing retainer and gasket from the case.

6. Remove the lubricant filler plug from the right side of the case. Working through the plug opening, drive the roll pin out of the case and countershaft with a 1/4-inch punch (Fig. 7).

7. On 6-cylinder vehicles with a model RAN transmission except Ford, tap the countershaft from the rear of the case with a dummy shaft to remove the expansion plug from the countershaft bore at the front of the case.

8. Hold the countershaft gear with a hook and with the tool shown in Fig. 8, push the countershaft out the rear of the case.

The countershaft (cluster) gear and thrust washers (Fig. 21) can be lowered to the bottom of the case.



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FIG. 6—Transmission Case and Related Parts—Typical

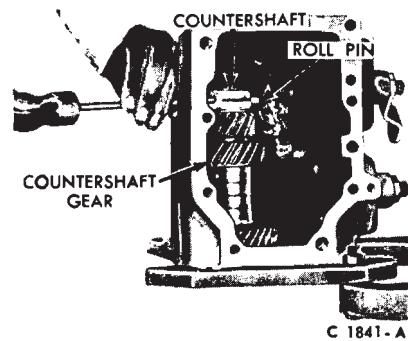
Remove the countershaft from the rear of the case.

9. On some models, remove the snap ring that secures the speedometer drive gear on the output shaft. Slide the speedometer drive gear off the shaft. Remove the speedometer drive gear lock ball from the shaft. If the vehicle is equipped with the new design retainer, depress the tang on the speedometer drive gear retaining clip and slide the gear off the output shaft (Fig. 11).

10. Remove the snap ring that retains the output shaft bearing on the shaft. Remove the bearing from the case and shaft as shown in Fig. 9.

11. Place both shift levers in the neutral (center) position.

12. Remove the set screw that secures the first and reverse shift fork to the shift rail. Slide the first and reverse shift rail out through the rear



C 1841-A

FIG. 7—Removing Countershaft Roll Pin

of the case.

13. Slide the first and reverse synchronizer forward as far as possible, and rotate the first and reverse shift fork upward. Then lift it from the case.

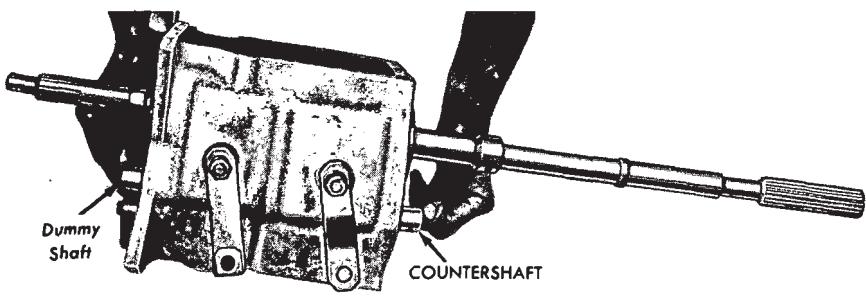
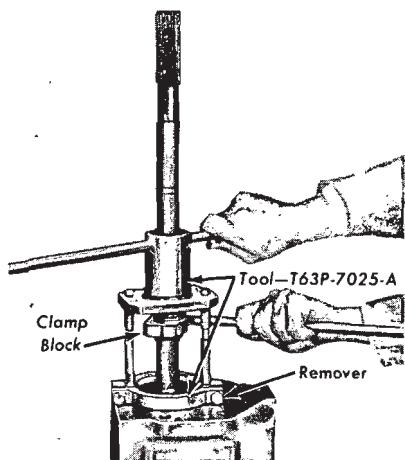


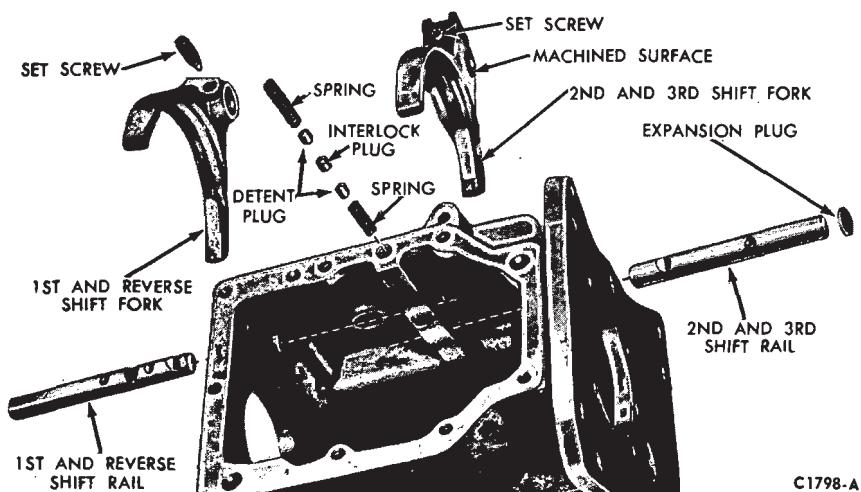
FIG. 8—Removing Countershaft

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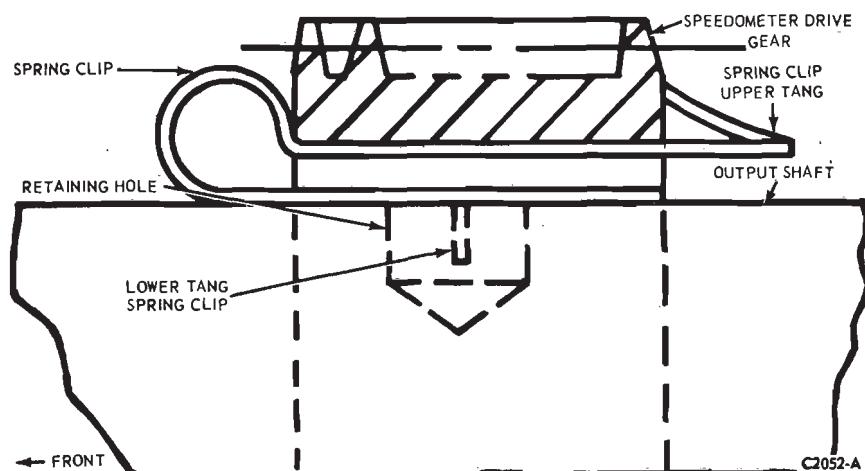
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FIG. 9—Removing Output Shaft Bearing



C1798-A

FIG. 10—Shift Rails and Forks Disassembled



C2052-A

FIG. 11—Speedometer Drive Gear Installation—New Design

14. Move the second and third-speed shift fork to the second-speed position to gain access to the set screw. Remove the set screw from the fork. Rotate the shift rail 90 degrees as shown in Fig. 12).

15. Lift the interlock plug (Fig. 10) from the case with a magnet.

16. Tap on the inner end of the

second and third-speed shift rail to remove the expansion plug (Fig. 10) from the front of the case. Remove the shift rail.

17. Remove the second and third-speed shift rail detent plug and spring from the detent bore.

18. Pull the input gear and shaft forward until the gear contacts the

case, and then remove the large snap ring. It is necessary to move the gear forward to provide clearance when removing the output shaft assembly from RAT model transmissions. On all other models, the input shaft and gear is removed from the front of the case at this time.

19. Rotate the second and third-speed shift fork upward, and lift it from the case.

20. Carefully lift the output shaft assembly out through the top of the case.

21. On an RAT model, work the input shaft bearing and gear back through the bore in the case and out through the top. Remove idler gear shaft, driving from the front of the case.

22. Lift the reverse idler gear and two thrust washer (Fig. 13) from the case. Lift the countershaft gear, thrust washer, and dummy shaft from the case.

23. Remove the snap ring from the front of the output shaft, and slide the synchronizer and the second-speed gear (Fig. 14) off the shaft.

24. Remove the next snap ring and tabbed thrust washer from the output shaft. Then slide the first gear and blocking ring off the shaft.

25. Remove the next snap ring from the output shaft. The first and reverse synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, remove the synchronizer hub using an arbor press as shown in Fig. 22. **Do not attempt to remove or install the hub by hammering or prying.**

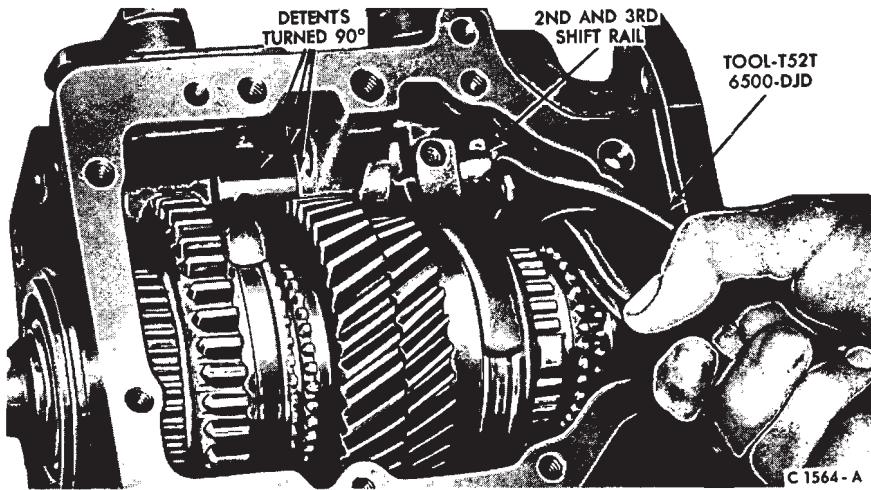


FIG. 12—Rotating Second and Third-Speed Shift Rail

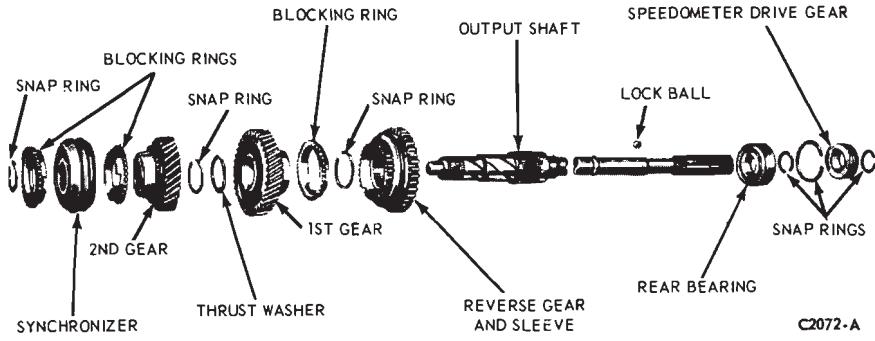


FIG. 14—Output Shaft Disassembled

PARTS REPAIR OR REPLACEMENT

SHIFT LEVERS AND SEALS

1. Remove the nut, lock washer, and flat washer that secure each shift lever (Fig. 15) to the lever and shaft in the transmission case. Lift the levers off the shaft. Slide each lever and shaft out of the case. Discard the O-ring from each shaft.

2. Lubricate the new seals with transmission lubricant and install them on the shafts.

3. Install the lever and shafts in the case.

4. Position a shift lever on each shaft and secure them with a flat washer, lock washer, and nut.

INPUT SHAFT BEARING

1. Remove the snap ring securing the input shaft bearing (Fig. 16), and press the input shaft out of the bearing.

2. Press the input shaft bearing onto the input shaft with the tool shown in Fig. 17, and install the snap

ring on the shaft.

SYNCHRONIZERS

1. Push the synchronizer hub from each synchronizer sleeve.

2. Separate the inserts and insert springs from the hubs. Do not mix the parts from the second and third-speed synchronizer with the first and reverse synchronizer (Figs. 18 and 19).

3. Install the rear insert spring in the groove of the first and reverse synchronizer hub. Make sure that the spring covers all insert grooves. Start the hub in the sleeve making sure that the alignment marks are properly indexed. Position the three inserts in the hub making sure that the small end is over the spring and that the shoulder is on the inside of the hub. Slide the sleeve and reverse gear onto the hub until the detent is engaged. Install the front insert spring in the hub to hold the inserts against the hub. Be sure the spring humps of the rear spring cover different inserts than the front spring humps (Fig. 20).

4. Install one insert spring (Fig. 19)

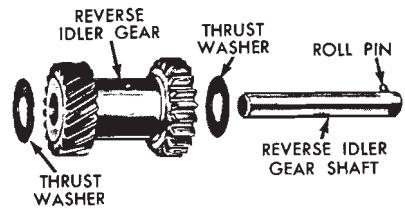


FIG. 13—Reverse Idler Shaft Disassembled

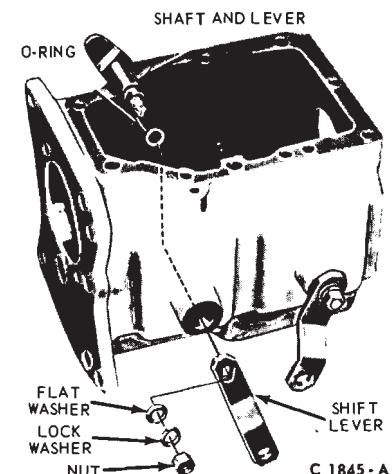


FIG. 15—Shift Lever and Shaft Disassembled

into a groove of the second and third speed synchronizer hub, making sure that all three insert slots are fully covered. With the alignment marks on the hub and sleeve aligned, start the hub into the sleeve. Place the three inserts on top of the retaining spring and push the assembly together. Install the remaining insert spring so that the spring ends cover the same slots as does the other spring. Do not stagger the springs. Place a synchronizer blocking ring on each end of the synchronizer sleeve.

COUNTERSHAFT GEAR BEARINGS

1. Remove the dummy shaft, fifty roller bearings, and the two bearing retainer washers from the countershaft gear (Fig. 21).

2. Coat the bore in each end of the countershaft gear with grease.

3. Hold the dummy shaft in the gear and install the twenty-five roller bearings and a retainer washer in each end of the gear.

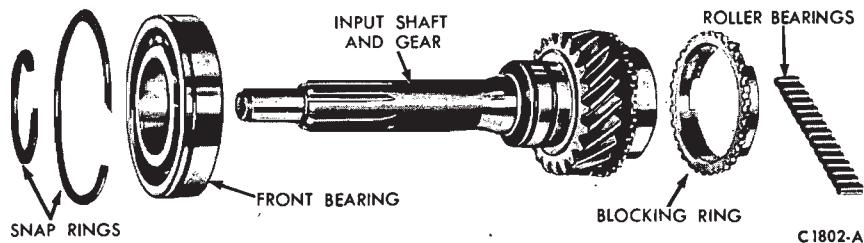


FIG. 16—Input Shaft Gear Disassembled

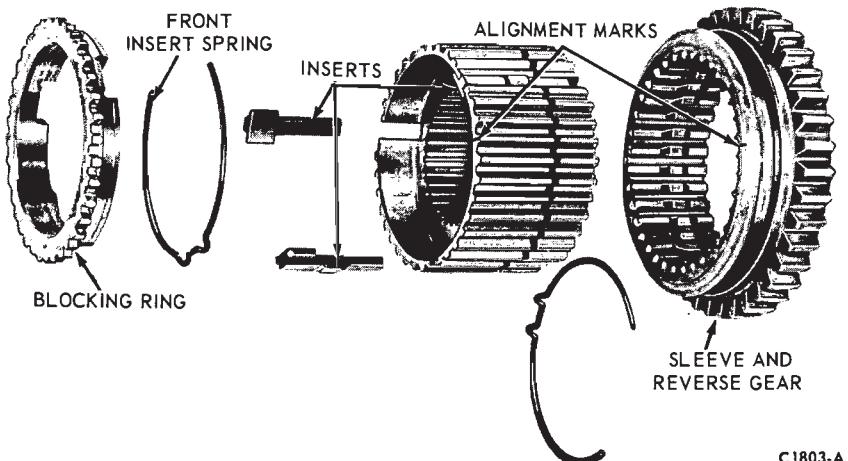


FIG. 18—First and Reverse Synchronizer Disassembled

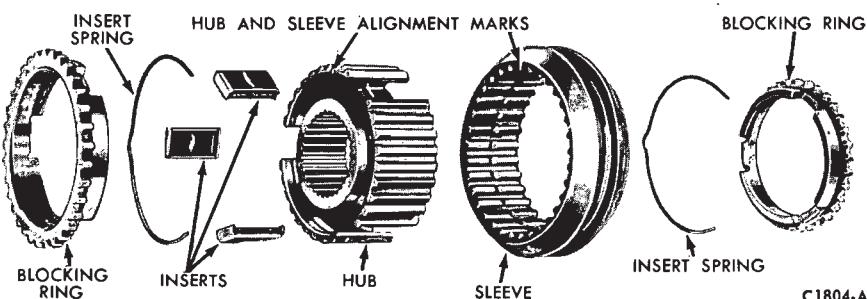


FIG. 19—Second and Third Synchronizer Disassembled

4. Position the countershaft gear, dummy shaft, and roller bearings in the case.

5. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.

6. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be within specification. If not within specification, replace the thrust washers.

7. After establishing the correct

end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case until the output and input shafts have been installed.

GEAR SHIFT LEVER AND CONTROL ASSEMBLY FLOOR-MOUNTED

1. Remove the four screws attaching the lower boot to the floor pan.

2. Remove the two bolts attaching the gear shift lever to the control assembly.

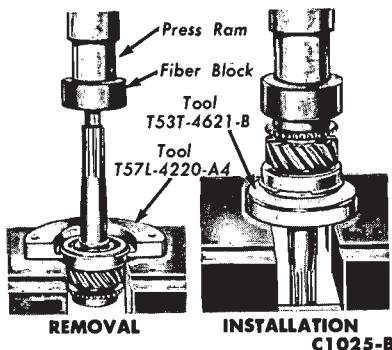


FIG. 17—Replacing Input Shaft Bearing

3. Remove the two piece lock nuts that connect the shift rods to the control assembly.

4. Remove the three bolts retaining the shift control assembly to the extension housing. Allow the back-up light switch to hang free.

5. Lower the control assembly from the vehicle and remove the boot.

6. Remove the nut from the selector lever shaft and remove the shaft from the assembly. Then, lift the selector arm and selector levers out of the support bracket. Do not lose the detent spring located between the first-reverse selector lever and the selector arm (Fig. 22).

7. Lubricate all mating surfaces with lithium grease before assembly.

8. Position the detent spring between the first-reverse selector lever and the selector arm. Be sure the wide base of the spring rests against the selector lever. Position the second-third selector lever against the selector arm and insert the entire assembly into the support bracket.

9. Install the selector lever shaft through the support bracket and selector lever assembly and install the retaining nut.

10. Slide the control assembly into the boot and attach the entire assembly to the extension housing. Do not lose the spacer located inside the assembly. Be sure the back-up light switch is properly installed.

11. Install the two bolts securing the gear shift lever to the shift control assembly.

12. Insert a 1/4 inch diameter alignment pin in the alignment holes of the control assembly.

13. Position the shift rods on the selector levers and install the lock nuts.

14. Remove the alignment pin.

15. Check the operation of the shift mechanism for smooth cross-over and adjust as required.

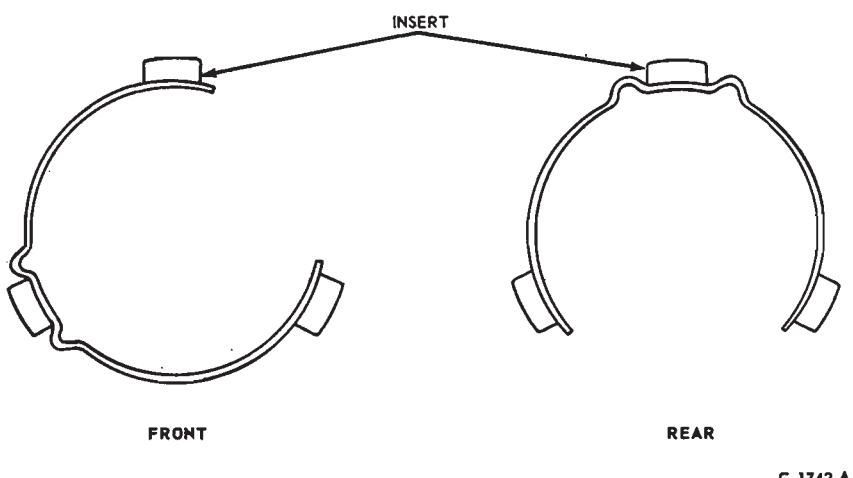


FIG. 20—First and Reverse Speed Synchronizer Insert Spring Installation

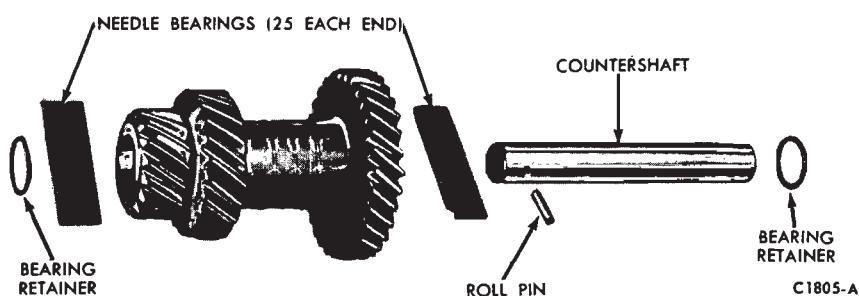


FIG. 21—Countershaft Gear Disassembled

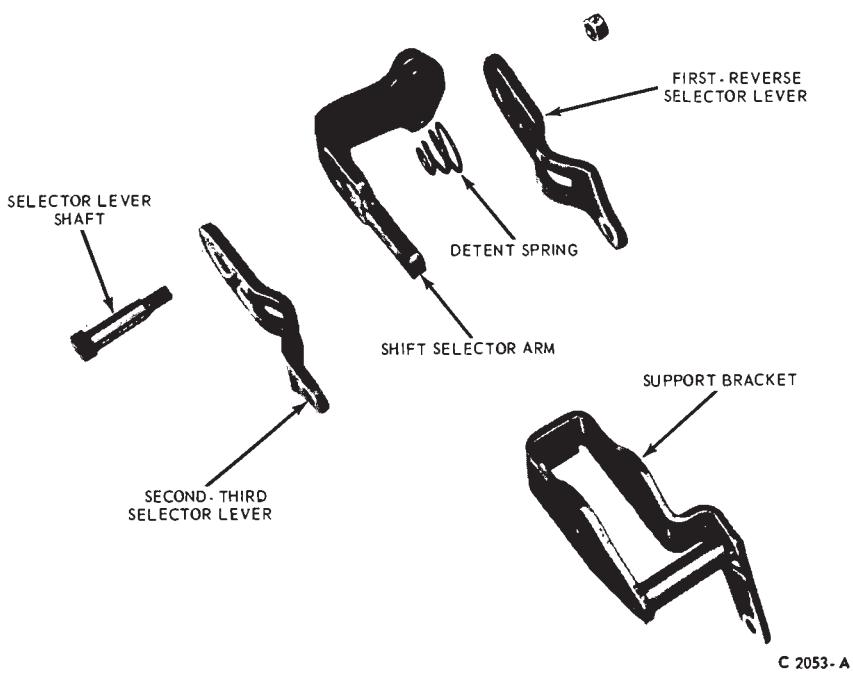


FIG. 22—Gear Shift Control Assembly Disassembled—3-Speed

ASSEMBLY

1. Coat the reverse idler gear thrust surfaces in the case with a thin film of lubricant and position the two thrust washers in place.

2. Position the reverse idler gear and dummy shaft in place. Align the gear bore and thrust washers with the case bores and install the reverse idler shaft.

3. Measure the reverse idler gear end play with a feeler gauge. End play should be within specification. If the end play is not within specification, replace the thrust washers. If the end play is within limits, leave the reverse idler gear installed.

4. Lubricate the output shaft splines and machined surfaces with transmission lubricant.

5. The first and reverse synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, install the synchronizer hub with the teeth end of the gear facing toward the rear of the shaft, using an arbor press as shown in Fig. 23. **Do not attempt to remove or install the hub by hammering or prying.**

6. Place the blocking ring on the tapered machined surface of the first gear.

7. Slide the first gear onto the output shaft with the blocking ring toward the rear of the shaft. Rotate the gear as necessary to engage the three notches in the blocking ring with the synchronizer inserts. Secure the first gear with the thrust washer and snap ring.

8. Slide the blocking ring onto the tapered machined surface of the second gear. Slide the second gear with blocking ring and the second and third gear synchronizer onto the mainshaft. The tapered machined surface of the second gear must be toward the front of the shaft. Make sure that the notches in the blocking ring engage the synchronizer inserts. Secure the synchronizer with a snap ring.

9. Coat the bore of the input shaft and gear with a thin film of grease. A thick film of grease will plug the lubricant holes and prevent lubrication to the bearings. Install the 15 bearings (Fig. 16) in the bore.

10. If working on a RAT model transmission, install the input gear and bearing through the top of the case and through the bore in front of the case. On RAN models, the input shaft is installed through the front of the transmission. Install the snap ring

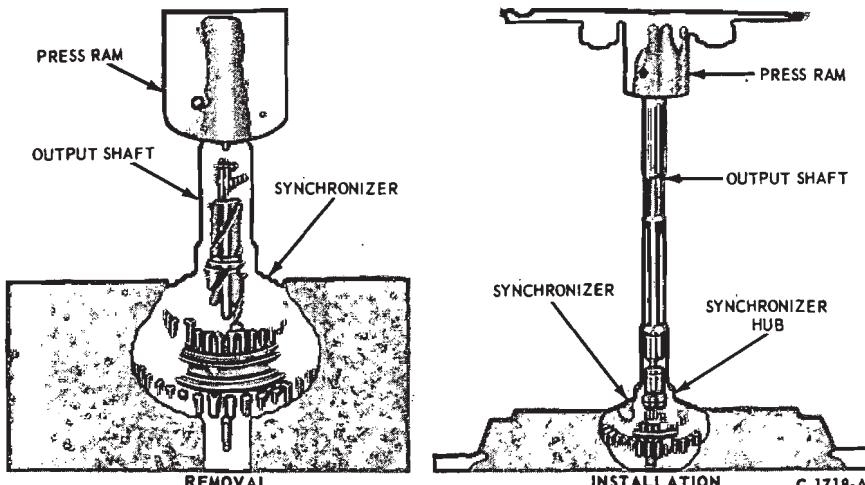


FIG. 23—Removing and Installing First and Reverse Synchronizer

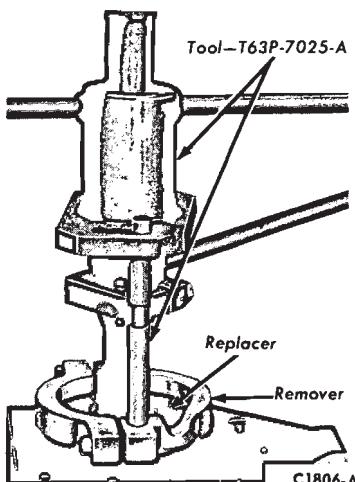


FIG. 24—Installing Output Shaft Rear Bearing

in the bearing groove.

11. Position the output shaft assembly in the case. Position the second and third-speed shift fork on the second and third-speed synchronizer.

12. Place a detent plug spring and a plug in the case (Fig. 9). Place the second and third-speed synchronizer in the second speed position (toward rear of transmission). Align the fork and install the second and third-speed shift rail. It will be necessary to depress the detent plug to enter the rail in the bore. Move the rail inward until the detent plug engages the forward notch (second-speed position).

13. Secure the fork to the shaft with the set screw. Move the synchronizer to the neutral position.

14. Install the interlock plug in the

case. If the second and third-speed shift rail is in the neutral position, the top of the interlock will be slightly lower than the surface of the first and reverse shift rail bore.

15. Move the first and reverse synchronizer forward to the first-speed position. Place the first and reverse shift fork in the groove of the first and reverse synchronizer. Rotate the fork into position and install the first and reverse shift rail. Move the rail inward until the center notch (neutral) is aligned with the detent bore. Secure the fork to the shaft with the set screw.

16. Install a new shift rail expansion plug in the front of the case.

17. Hold the input shaft and blocking ring in position. Then move the output shaft forward to seat the pilot in the roller bearings of the input gear.

18. Tap the input gear bearing into place in the case while holding the output shaft to prevent the roller bearings from dropping. Install the front bearing retainer and new gasket making sure that the oil return slot is at the bottom of the case. Install and torque the attaching screws to specification.

19. Install the large snap ring on the rear bearing. Place the bearing on the output shaft with the snap ring end toward the rear of the shaft. Press the bearing into place with the tool shown in Fig. 24. Secure the bearing to the shaft with a snap ring.

20. On some models, hold the speedometer drive gear lock ball in the detent and slide the speedometer

drive gear into place. Secure the gear with a snap ring. On models equipped with the new design retainer, install the speedometer drive gear retaining clip on the shaft with the lower tang in the retaining hole. Align the groove in the gear with the clip and slide the gear forward until the upper tang on the clip locks the gear (Fig. 10).

21. Place the transmission in the vertical position. Working through the drain hole in the bottom of the case, align the bore of the countershaft gear and the thrust washers with the bore of the case with a screwdriver.

22. Working from the rear of the case, push the dummy shaft out of the countershaft gear with the countershaft. Before the countershaft is completely inserted in the bore, make sure that the hole that accommodates the roll pin is aligned with the hole in the case. Drive the shaft into place and install the roll pin. On all 8 cylinder vehicles and Ford 6 cylinder models, the countershaft is a press fit in the case. On 6 cylinder models with model RAN transmissions there is a countershaft-to-case clearance of 0.020 inch at the front bore and 0.010 at the rear bore. On these 6 cylinder models, install a new expansion plug in the countershaft bore at the front of the case.

23. Coat a new extension housing gasket with sealer and position it on the case.

24. Install lock washers on the five attaching screws. Dip the threads of the cap screws in sealer. Secure the housing to the case and torque the cap screws to specification.

25. Install the filler and drain plugs (if equipped) in the case. Make sure that the magnetic plug is installed in the bottom of the case.

26. Place the transmission in gear. Pour lubricant over the entire gear train while rotating the input or output shaft.

27. Install the remaining detent plug in the case. Install the long spring (which is retained by the case) to secure the detent plug.

28. Coat a new cover gasket (Fig. 6) with sealer. Secure the cover with cap screws. Torque the screws to specification.

29. Check the operation of the transmission in all of the gear positions.

5 SPECIFICATIONS

3-SPEED TRANSMISSIONS

Car Model	Engine	Trans. Model	Gear Ratios		
			1st	2nd	Rev.
Ford, Meteor	240-1V 302-2V	RAT-AW	2.99	1.75	3.17
Fairlane Montego	250-1V	RAN-AW			
Mustang	200-1V 250-1V	RAN-AV			
Ford, Mercury, Meteor	390-2V, 4V	RAT-AX	2.42	1.61	2.33
Ford Meteor	351-2V	RAT-BL	2.99	1.75	3.17
Fairlane Montego	302-2V	RAT-AY			
Fairlane Montego	351-2V 4V	RAT-AZ	2.42	1.61	2.33
Mustang Cougar	302-2V	RAT-BA	2.99	1.75	3.17
Mustang Cougar	351-2V 4V	RAT-BB	2.42	1.61	2.33
Fairlane Montego	351-2V	RAT-BF	2.99	1.75	3.17
Falcon	200-1V	RAN-BC	2.99	1.75	3.17
	302-2V	RAT-BK			
Maverick	170-1V	RAN-BA	3.41	1.86	3.51
	200-1V	RAN-BB	2.99	1.75	3.17

CC2140-A

TRANSMISSION COMPONENT END PLAY

Component	Inches
Cluster Gear to Case	.004 - .018
Reverse Idler Gear to Case	.004 - .018

CC2141-A

LUBRICANT REFILL CAPACITY

Trans. Type	Application	Lubricant Specification	Capacity (Pints)
3 Spd.	All Models	ESW-M2C83-B	3.5*

*To Bottom of Filler Hole

CC2142-A

TORQUE SPECIFICATIONS

Application	Torque Lb. Ft. 3 Spd.	Application	Torque Lb. Ft.
			3 Spd.
Input Shaft Bearing Retainer to Case Bolt	30-36	Shift Fork to Shift Rail Screw	10-18
Extension Housing to Case Bolt	42-50	Filler Plug to Case	10-20
Access Cover to Case Screw	14-19	Drain Plug to Case	20-30
Outer Gear Shift Levers to Cam and Shaft Nut	18-23	Shift Control to Extension	96-144①

①Inch Pounds

CC2143-A

SPECIAL TOOLS

Tool Numbers	Description
T50T-100A	Impact Hammer—Long
T59L-100B	Impact Hammer—Short
Tool-1175AB	Grease Seal Remover
T57L-4220-A4	Differential Side Bearing Cone Replacer or Input Shaft Bearing Remover
T52L-7000-GAE	Extension Housing Bushing and Seal Remover
T63P-7025-A	Output Shaft Bearing Remover & Replacer
Tool-7025-B	Rear Main Shaft Bearing Remover
Tool-7025-G	Main Shaft Bearing Remover & Replacer

SPECIAL TOOLS (Continued)

Tool Numbers	Description
T64P-7111-A	Cluster Gear Roller Retainer Shaft
T63P-7111-A	Cluster Gear Roller Retainer Shaft
T64P-7140-A	Reverse Idler Shaft Remover
T61L-7657-A	Transmission Extension Housing Oil Seal Replacer
T57P-7697-B	Extension Housing Bushing Replacer
T57P-7657-G	Extension Housing Bushing Replacer
T67P-7341-A	Shift Linkage Grommet Replacer
Tool-3583-J	Input Shaft Seal Installer

CC2144-A

PART 16-04 Ford Design Four-Speed Transmission

COMPONENT INDEX Applies Only To Models Indicated	Ford	Mercury	Meteor	Cougar	Fairlane	Falcon	Maverick	Montego	Mustang
CAM AND SHAFT SEALS Parts Repair or Replacement	N/A	N/A	N/A	04-05	04-05	N/A	N/A	04-05	04-05
COUNTERSHAFT GEAR BEARINGS Parts Repair or Replacement	N/A	N/A	N/A	04-06	04-06	N/A	N/A	04-06	04-06
INPUT SHAFT BEARING Parts Repair or Replacement	N/A	N/A	N/A	04-06	04-06	N/A	N/A	04-06	04-06
INPUT SHAFT SEALS Parts Repair or Replacement	N/A	N/A	N/A	04-07	04-07	N/A	N/A	04-07	04-07
LOCK ROD Adjustment	N/A	N/A	N/A	04-02	04-02	N/A	N/A	04-02	04-02
SHIFT CONTROL Description	N/A	N/A	N/A	04-01	04-01	N/A	N/A	04-01	04-01
Removal and Installation	N/A	N/A	N/A	04-03	04-03	N/A	N/A	04-03	04-03
SHIFT LINKAGE Adjustments	N/A	N/A	N/A	04-02	04-02	N/A	N/A	04-02	04-02
SYNCHRONIZERS Disassembly and Overhaul	N/A	N/A	N/A	04-06	04-06	N/A	N/A	04-06	04-06
TRANSMISSION COMPLETE Cleaning and Inspection (See Part 16-01) Description	N/A	N/A	N/A	04-01	04-01	N/A	N/A	04-01	04-01
Removal and Installation	N/A	N/A	N/A	04-04	04-04	N/A	N/A	04-04	04-04
Disassembly and Overhaul	N/A	N/A	N/A	04-04	04-04	N/A	N/A	04-04	04-04

A page number indicates that the item is for the vehicle(s) listed at the head of the column.
N/A indicates that the item is not applicable to the vehicle(s) listed.

1 DESCRIPTION

DESCRIPTION

The Ford designed 4-speed transmission (Fig. 1) is of the fully synchronized type with all gears except the reverse sliding gear being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves.

New shift rails provide a shorter shift travel. A new design reverse lever permits use of an additional control rod for locking the transmission in reverse through the steering column (Fig. 1). With the shorter shift travel, the shift levers at the side of the transmission have been redesigned to maintain acceptable shift ef-

forts.

All forward-speed gears in the transmission are helical-type, however, the reverse sliding gear and the exterior of the first-and second-speed synchronizer sleeve are spur-type gears. The specifications of this section Part 16-04, lists the transmission model numbers and vehicles in which they are used.

A transmission service identification tag is located on the right side of the case at the front (Fig. 2). The first line on the tag will show the transmission model and service identification code when required. The second line will show the transmission serial number. Additionally, a serial number

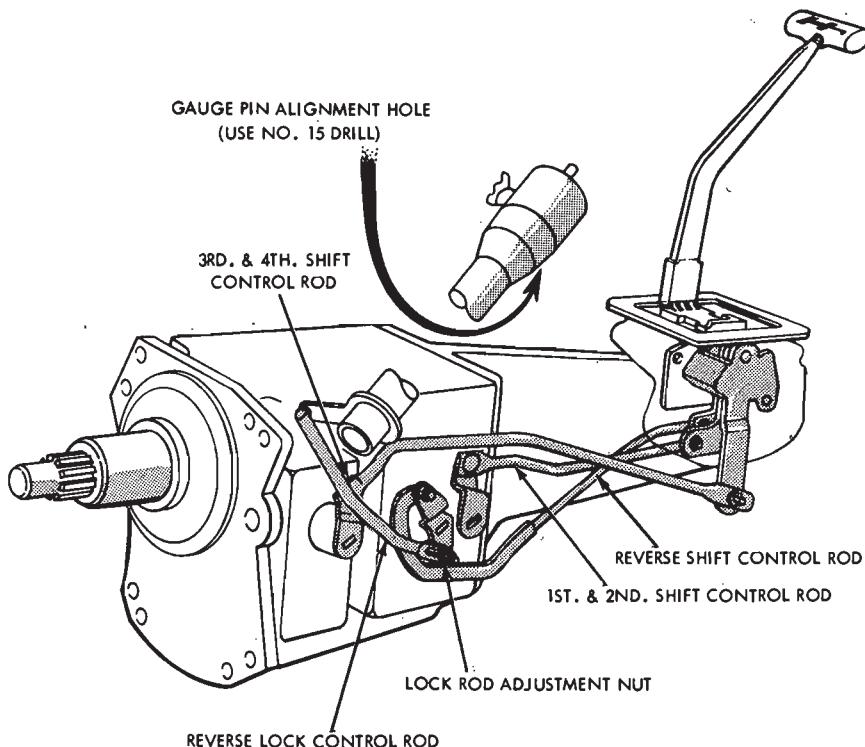
is stamped on the top side of the flange on the case for further identification.

SHIFT CONTROL

DESCRIPTION

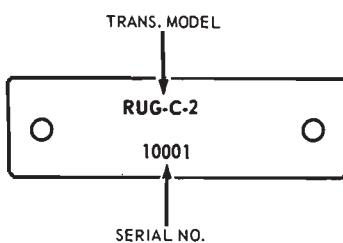
The four-speed transmission for 1970 is controlled with a Hurst Shift Control assembly. It is a unit design to be serviced on a limited basis only. It is not to be disassembled. The only parts to be removed from it are the shift lever, shift lever handle, back-up light switch retainer and back-up light switch (Fig. 1).

The shift pattern for the control



C2131-A

FIG. 1—Four-Speed Transmission—Typical



C 2088-A

FIG. 2—Transmission Identification Tag

unit is imprinted on the shift lever handle. An automatically adjusted back-up light switch is installed in an indexing retainer at the lower rear portion of the shift control assembly.

A one-piece rubber boot mounted from the top side of the floor pan extends downward to protect the shifter assembly from road splash. A fitted opening stretches tightly over the shifter mounting plate. Other openings in the boot provide access for the shifter assembly, back-up light retainer bracket and the shift levers.

2 IN-VEHICLE ADJUSTMENTS AND REPAIRS

SHIFT LINKAGE ADJUSTMENT

1. Disconnect the battery ground terminal.
2. With the shift lever in the neutral position, pull the lower boot up far enough to insert alignment tool into the shift control assembly. Be sure the tool is completely through and located in the notches on both sides of the shift control housing.
3. Withdraw the alignment tool completely, and re-insert it. If the tool enters all holes through the levers and notches in the housing freely, the shift assembly is properly aligned.
4. If any lever does not accept the insertion of the tool it is out of alignment. Observe the levers while inserting the tool. A lever that moves as the tool is inserted, is slightly misaligned and must be adjusted correctly.
5. For any lever that is misaligned, loosen the nuts attaching the transmission shift control rods to the shift levers.

6. Disconnect the reverse shift rod at the shift control assembly.

Rotate the reverse lever of the transmission clockwise so the transmission will be shifted into reverse gear. The reverse lever is the one in the center.

7. Tighten the two forward speed shift rods at the control assembly to specification.

8. Rotate the reverse transmission lever counterclockwise until it stops.

9. Attach the reverse shift rod to the control assembly and torque the nut to specification.

10. Remove the alignment tool.

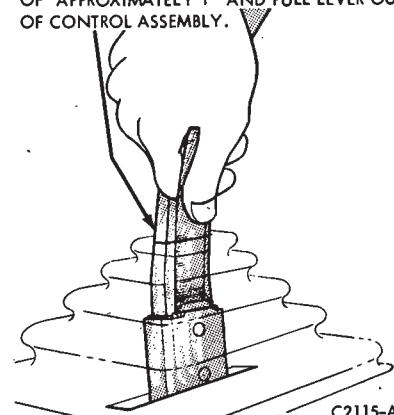
11. Connect the battery ground terminal and check the shift mechanism through all shift positions.

12. Be sure the boot is properly positioned.

LOCK ROD ADJUSTMENT

Adjustment can be correctly made only when the shift control alignment

THIN RULE OR PIECE OF .015" TO .020" THICK SHIM STOCK. INSERT TO A DEPTH OF APPROXIMATELY 1" AND PULL LEVER OUT OF CONTROL ASSEMBLY.



C2115-A

FIG. 3—Shift Lever Removal

is right.

1. Position the hand shift lever in neutral.
2. Align the hole in the steering column socket casting with the col-

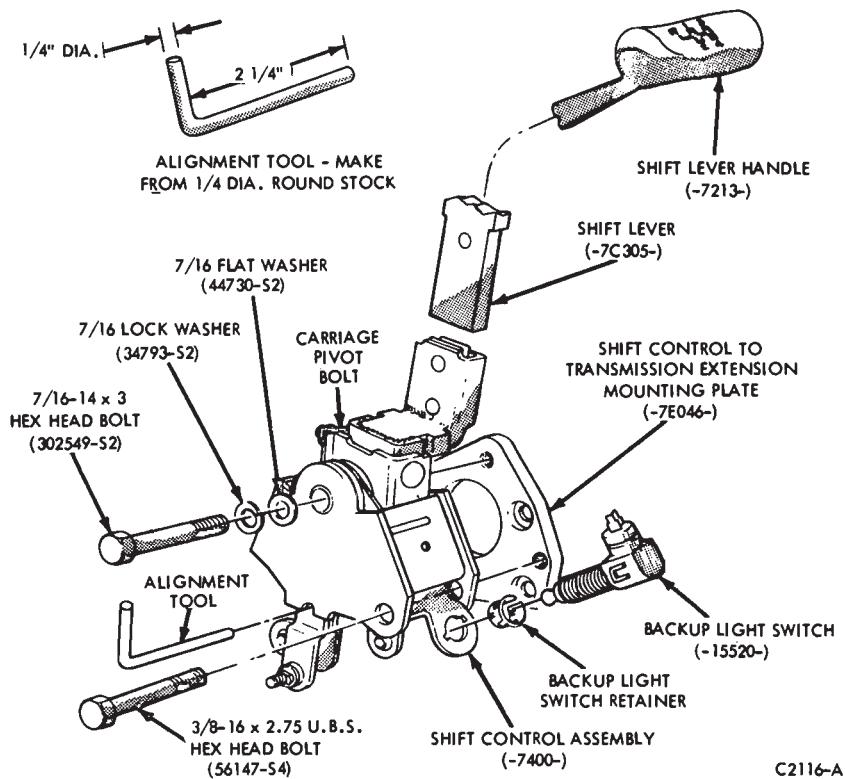


FIG. 4—Shift Control Assembly Removal

umn alignment mark and insert a .180 diameter (No. 15) drill (rod). The column casting must not rotate with the drill (rod) in position.

3. Tighten the adjustment nut to specified torque.

4. Check for proper operation.

SHIFT CONTROL REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the battery ground terminal.

2. Remove the shift lever as shown in Fig. 3.

3. Remove the four retaining screws attaching the bezel and upper and lower shift lever boots to the floor and remove the bezel and the upper boot.

4. From under the vehicle, remove the nuts and washers, attaching the transmission shift rods to the shift control levers.

5. Disconnect the electrical connector from the back-up light switch.

6. If the back-up light switch is functional, remove the switch from the unit by pulling the switch from the retainer. A slight rotation in both

directions while pulling the switch will facilitate removal. Do not use pliers or other such tools or damage to the switch will result.

7. Carefully pull the opening in the lower boot for the transmission shifter mounting plate down and over the shift assembly. Use care to avoid tearing the boot.

8. Remove the bolts, flat and lock washers attaching the shift control assembly to the mounting plate on the transmission extension housing and remove the shift control assembly (Fig. 4).

INSTALLATION

1. Before installing the shift control assembly, check the shift assembly mounting plate-to-transmission extension housing attaching screws for proper torque. Torque to specification if required.

2. With shift control levers all in mid-position (neutral) of travel, insert alignment tool. Be sure tool is completely through and located in notches on both sides of the shift control housing.

3. Install lock and flat washers on

the shift control assembly upper attaching bolt and insert through holes in the shift control assembly. The flat washer must be positioned to contact the shift assembly. Be sure to install the larger diameter bolt at the top.

4. Tighten attaching bolts to specification. Do not remove the alignment tool.

5. Pull the lower boot down and around the shift assembly making sure the boot is snug around the mounting plate on the transmission, and all levers and the back-up light switch mounting bracket protrude from the proper holes in the boot.

6. Rotate the reverse lever of the transmission clockwise so that the transmission will be shifted into reverse gear. The reverse lever is the one in the center.

7. Position the two forward speed shift control rods to the corresponding transmission shift levers. Assemble the washers and nuts and torque to specification.

8. Rotate the reverse transmission lever counterclockwise until it stops.

9. Position the reverse shift control rod to the reverse lever, assemble the washer and nut and torque to specification. Remove the alignment tool.

10. Position the steering column socket casting in the neutral position and insert the proper alignment pin. Shift the transmission into third or fourth gear.

11. Connect the lock control rod at the reverse lever. Lubricate all connections to specification, and shift the transmission back to neutral.

12. Index properly and install back-up light switch retainer into bracket at lower rear of shift control. Index and install back-up light switch into retainer as far as possible without forcing.

13. Install back-up light switch connector on switch.

14. From inside of the vehicle, install the shift lever into the shift control assembly inserting the lever until the retainer clicks to assure that it is locked in.

15. Check shift assembly through all shift positions. When shift lever is shifted into reverse position this will automatically locate back-up light switch in proper position.

16. Connect battery ground terminal.

17. Road test the vehicle and check shifting and back-up light for proper functioning.

3 REMOVAL AND INSTALLATION

REMOVAL—TRANSMISSION

1. Raise the vehicle on a hoist.
2. Mark the driveshaft so that it may be installed in the same relative position. Disconnect the drive shaft from the rear U-joint flange. Slide the drive shaft off the transmission output shaft and install the extension housing seal installation tool into the extension housing to prevent lubricant leakage. See Fig. 5, Part 16-01.
3. Disconnect the speedometer cable from the extension housing.
4. Disconnect the parking brake cable from the equalizer lever and separate the lever from the crossmember.
5. Remove the hairpin retainer securing the cable to the transmission rear support crossmember, and then pull the cable assembly forward and out of the crossmember.
6. Remove the retaining clip, flat washer, and spring washer that secures the shift rods to the shift levers.
7. Remove the shift control.
8. Support the engine with a transmission jack and remove the extension housing-to-engine rear support attaching bolts.
9. Raise the rear of the engine high enough to remove the weight from the crossmember. Remove the bolts retaining the crossmember to the frame side supports and remove the crossmember.
10. Support the transmission on a jack and remove the bolts that attach the transmission to the flywheel housing.

ing.

11. Move the transmission and jack rearward until the transmission input shaft clears the flywheel housing. If necessary, lower the engine enough to obtain clearance for transmission removal.

Do not depress the clutch pedal while the transmission is removed.

INSTALLATION

1. Make sure that the mounting surface of the transmission and the flywheel housing are free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until the input shaft splines enter the clutch hub splines and the case is positioned against the flywheel housing.
2. Install the two upper transmission to flywheel housing, mounting bolts snug, and then remove the two guide pins. Install the two lower mounting bolts. Torque all mounting bolts to specifications.
3. Raise the rear of the engine and install the crossmember. Install and torque the crossmember attaching bolts to specifications, then lower the engine.
4. With the transmission extension housing resting on the engine rear support, install the transmission extension housing attaching bolts. Torque the bolts to specifications.
5. Position the shift linkage control bracket to the extension housing and
6. Secure each shift rod to its respective lever with the spring washer, flat washer, and retaining pin.
7. Guide the parking brake cable assembly through the hole in the transmission rear support crossmember. Secure the cable assembly to the crossmember with the hair pin retainer.
8. Insert the parking brake front cable in the equalizer and install the equalizer in the bracket on the crossmember. Secure the parking brake rear cable to the equalizer.
9. Connect the speedometer cable to the extension housing.
10. Remove the extension housing installation tool and slide the forward end of the drive shaft over the transmission output shaft. Connect the drive shaft to the rear U-joint flange.
11. Place both forward gear shift levers and the reverse shift lever in the neutral position and insert a 1/4 inch diameter alignment tool in the shift linkage alignment hole (Fig. 19). It may be necessary to loosen the adjustment nuts to install the alignment tool. Adjust the linkage as necessary and tighten the adjustment nuts to specifications. Remove the alignment tool.
12. Fill the transmission to the proper level with the specified lubricant.
13. Lower the car. Check the shift and crossover motion for full shift engagement and smooth crossover operation.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant.
2. Remove the cover attaching screws from the case. Lift the cover and gasket from the case.
3. Remove the long spring that retains the detent plug in the case (Fig. 6). Remove the detent plug with a small magnet.
4. Remove the extension housing attaching screws and lock washers. Remove the housing and the gasket.

5. Remove the input shaft bearing retainer attaching screws. Slide the retainer off the input shaft.

6. Support the countershaft gear with a wire hook. Working from the front of the case, push the countershaft out the rear of the case as shown in Fig. 5. Lower the countershaft to the bottom of the case with the wire hook. Remove the hook.

7. Place the first and second-speed gear shift lever and the reverse shift lever in the neutral position. Place the third and fourth-speed gear shift lever in the third-speed position.

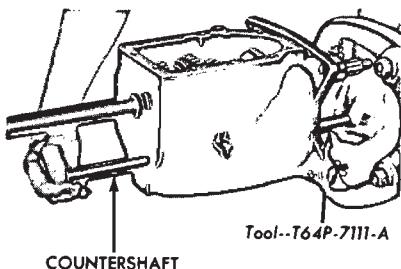
8. Remove the attaching screw from the third and fourth-speed shift fork. Tap on the inner end of the shift rail to unseal the expansion plug from the front of the case. Then withdraw the third and fourth-speed shift rail from the front of the case. Do not lose the interlock pin from the shift rail.

9. Remove the set screw from the first and second-speed shift fork. Slide the first and second-speed shift rail out the rear of the case.

10. Remove the interlock plug and the detent plug from the top of the

case (Fig. 6) with a magnet.

11. On some models, remove the snap ring that secures the speedometer drive gear to the output shaft.



C2073-A

FIG. 5—Removing Countershaft From Case

Slide the gear off the shaft, then remove the speedometer gear drive ball. On models equipped with the new design retainers, depress the tang on the speedometer drive gear retaining clip and slide the speedometer gear off the shaft. (Fig. 7).

12. Remove the snap ring that secures the output shaft bearing to the shaft.

13. Remove the output shaft bearing as shown in Fig. 8.

14. Remove the input shaft and bearing and the blocking ring from the front of the case.

15. Move the output shaft to the right side of the case to provide clearance for the shift forks. Rotate the forks as shown in Fig. 9, then lift them from the case.

16. Support the thrust washer and

first-speed gear to prevent them from sliding off the shaft, then lift the output shaft assembly from the case as shown in Fig. 10.

17. Remove the reverse gear shift fork set screw. Rotate the reverse shift rail 90 degrees as shown in Fig. 11. Slide the shift rail out of the rear of the case. Lift the reverse shift fork from the case.

18. Remove the reverse detent plug and spring from the case with a magnet.

19. Remove the reverse idler gear shaft from the case as shown in Fig. 12.

20. Lift the reverse idler gear and the thrust washers from the case. Be careful not to drop the bearings and the dummy shaft from the gear.

21. Lift the countershaft gear and the thrust washers from the case. Be careful not to drop the bearings or the dummy shaft from the countershaft gear.

22. Remove the snap ring from the front of the output shaft. Slide the third and fourth-speed synchronizer (Fig. 13) blocking ring and the third-speed gear off the shaft.

23. Remove the next snap ring and the second-speed gear thrust washer from the shaft. Slide the second-speed gear and the blocking ring off the shaft.

24. Remove the next snap ring.

25. Remove the thrust washer, first speed gear and blocking ring from the rear of the shaft. The first and second synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, remove the synchronizer hub using an arbor press as shown in Part 16-03, Fig. 20. **Do not attempt to remove or install the hub by hammering or prying.**

PARTS REPAIR OR REPLACEMENT

CAM AND SHAFT SEALS

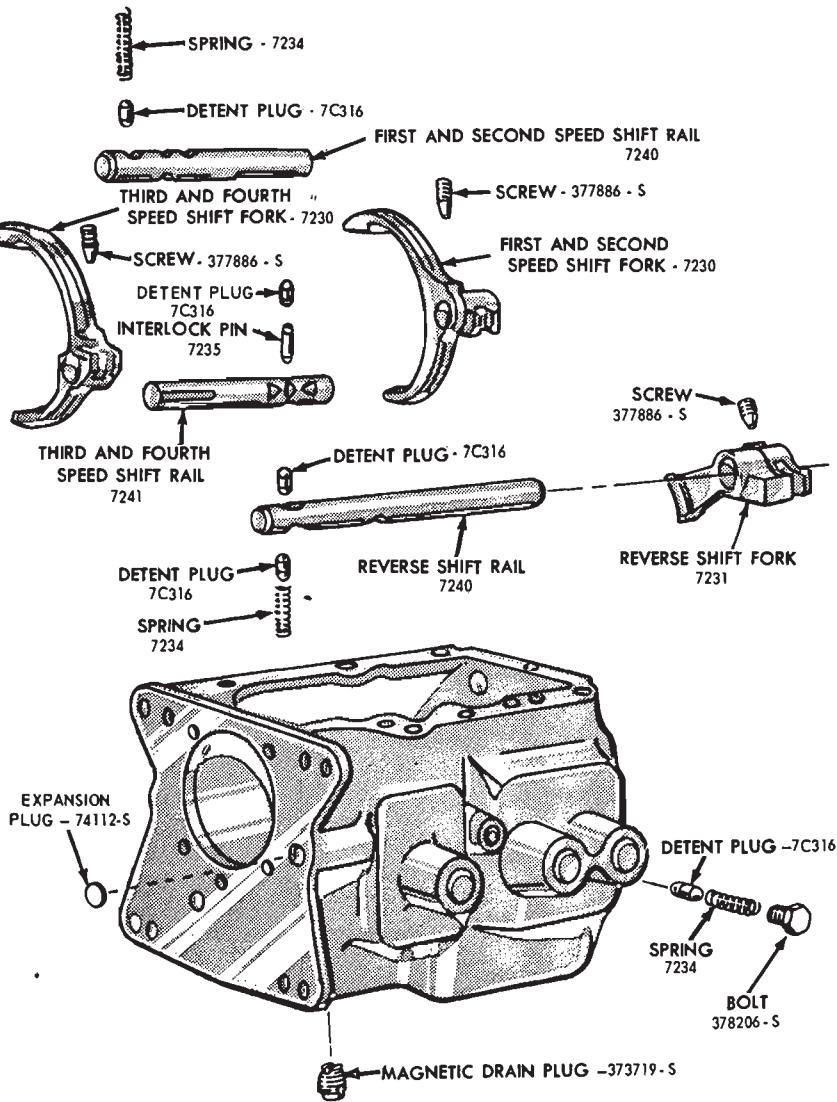
1. Remove the attaching nut, lock washer and the flat washer from each shift lever and remove the three levers.

2. Remove the three cam and shafts from inside the case.

3. Remove and discard the O-ring from each cam and shaft (Fig. 14).

4. Dip the new O-rings in gear lubricant and install them on the cam and shafts.

5. Slide each cam and shaft into its



C2074-A

FIG. 6—Shift Rails and Forks Disassembled

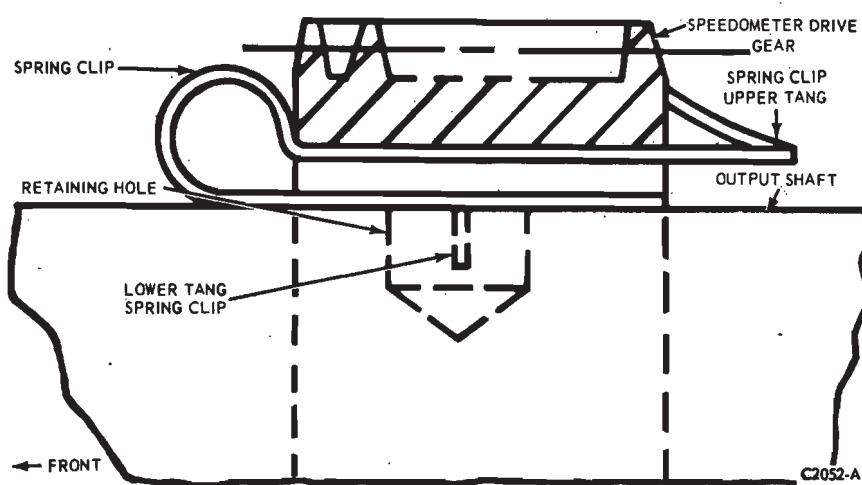


FIG. 7—Speedometer Drive Gear Installation

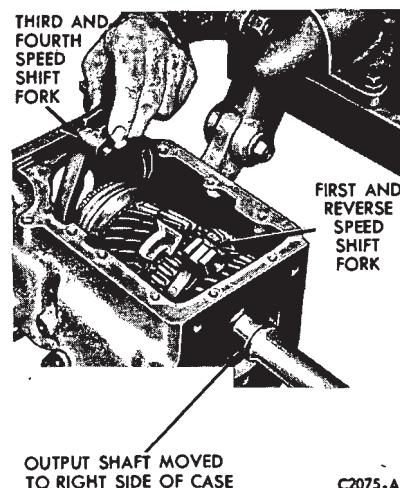


FIG. 9—Removing Shift Fork From Case

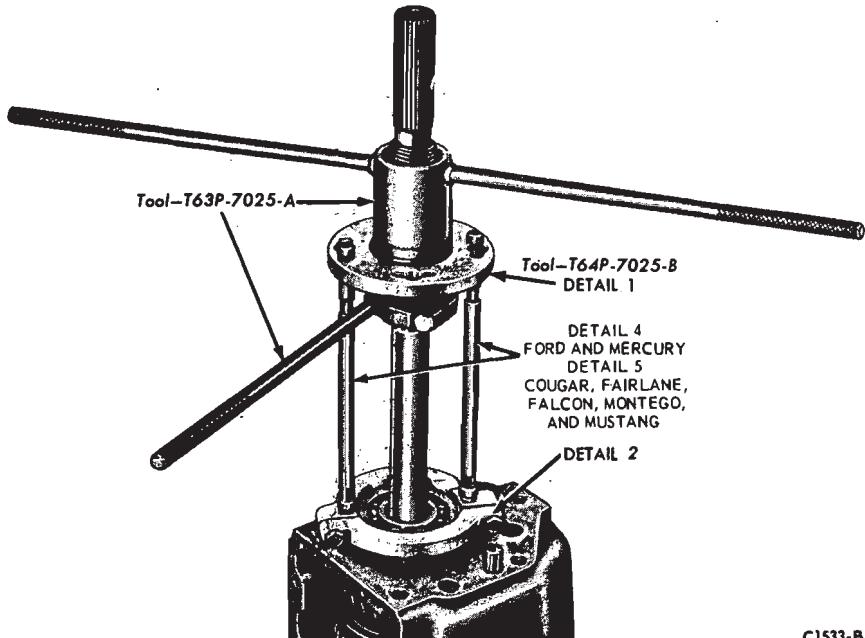


FIG. 8—Removing Output Shaft Bearing

respective bore in the transmission case.

- Secure each shaft lever with a flat washer, lock washer and nut.

INPUT SHAFT BEARING

- Remove the snap ring that secures the bearing to the shaft (Fig. 15).
- Press the input shaft gear out of the bearing as shown in Fig. 16.
- Press a new bearing onto the input shaft with the tool shown in Fig. 15.
- Secure the bearing with a snap ring.

SYNCHRONIZERS

- Push the synchronizer hub from each synchronizer sleeve (Fig. 17).
- Separate the inserts and insert springs from the hubs. Do not mix the parts of the first and second-speed synchronizer with the third and fourth-speed synchronizer.
- Position the hub in the sleeve, making sure that the alignment marks are properly indexed.
- Place the three inserts into place on the hub. Install the insert springs making sure that the irregular surface (hump) is seated in one of the inserts. Do not stagger the springs.

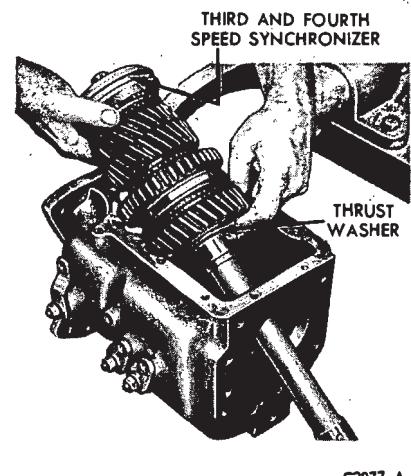


FIG. 10—Removing Output Shaft Assembly

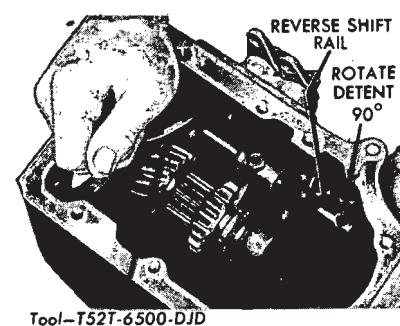


FIG. 11—Rotating Reverse Shift Rail

COUNTERSHAFT GEAR BEARINGS

- Remove the dummy shaft, two bearing retainer washers, and the 21

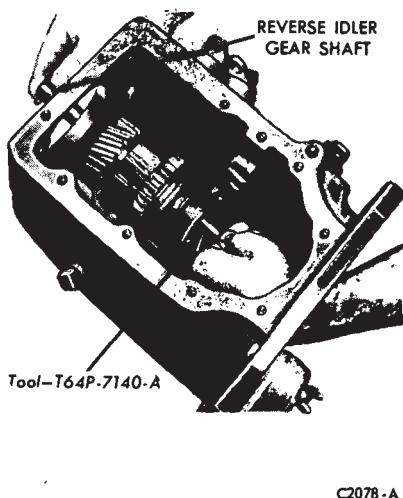


FIG. 12—Removing Reverse Idler Gear Shaft

roller bearings (Fig. 18) from each end of the countershaft gear.

2. Coat the bore in each end of the countershaft gear with grease.

3. Hold the dummy shaft in the gear and install the 21 roller bearings and a retainer washer in each end of the gear.

REVERSE IDLER GEAR BEARINGS

1. Slip the reverse idler sliding gear off the reverse idler gear (Fig. 19).

2. Remove the dummy shaft, two bearing retainer washers and the 44 roller bearings from the reverse idler gear.

3. Coat the bore in each end of the reverse idler gear with grease.

4. Hold the dummy shaft in the gear and install the 22 roller bearings

and the retainer washer in each end of the gear.

5. Install the reverse idler sliding gear on the reverse idler gear making sure that the shift fork groove is toward the front (Fig. 19).

INPUT SHAFT SEAL

1. Remove the seal from the input shaft bearing retainer as shown in Fig. 20.

2. Coat the sealing surface with lubricant.

3. Install the seal as shown in Fig. 21.

ASSEMBLY

1. Coat the countershaft gear thrust surfaces in the case with a thin film of lubricant and position a thrust

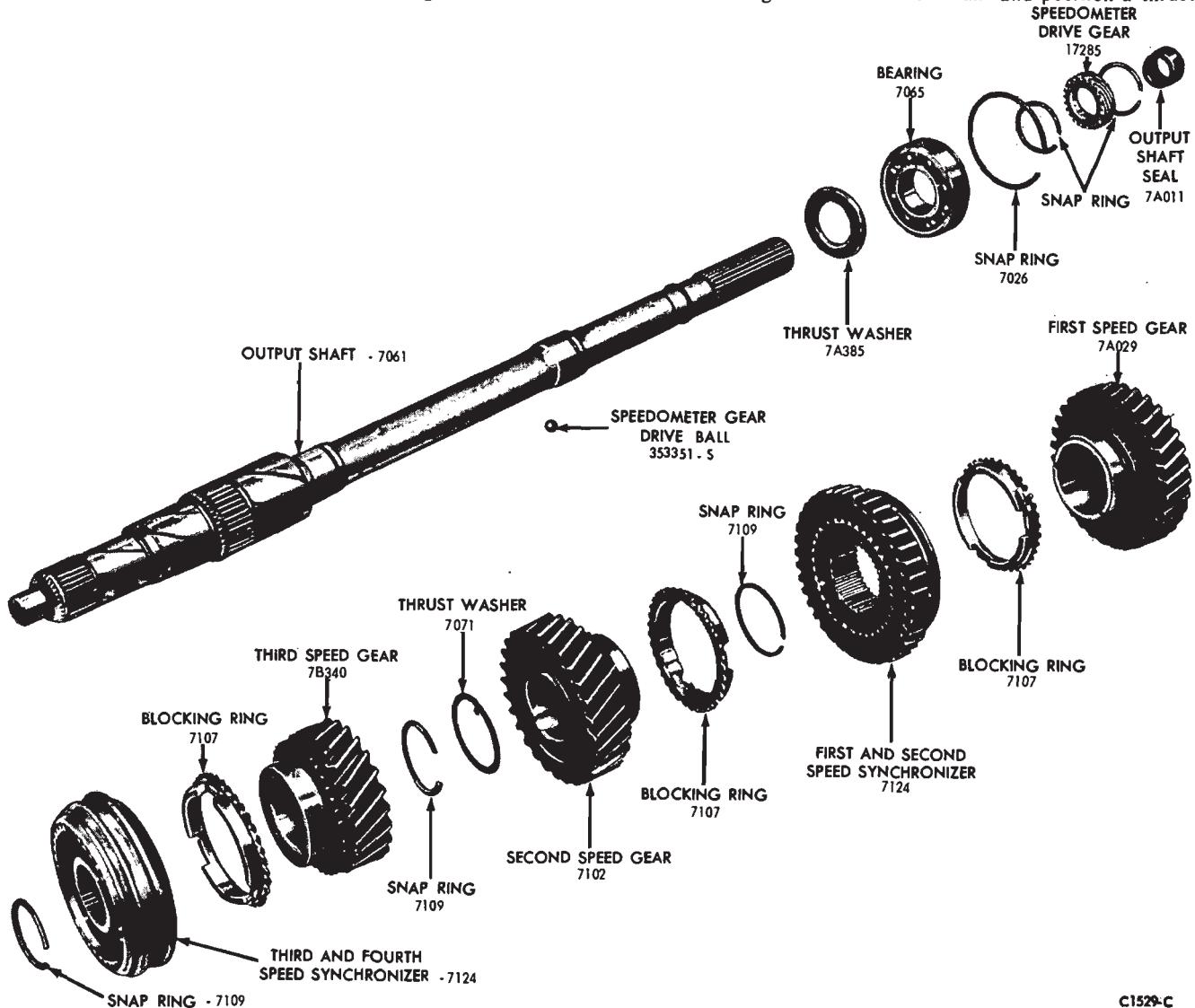


FIG. 13—Output Shaft Disassembled

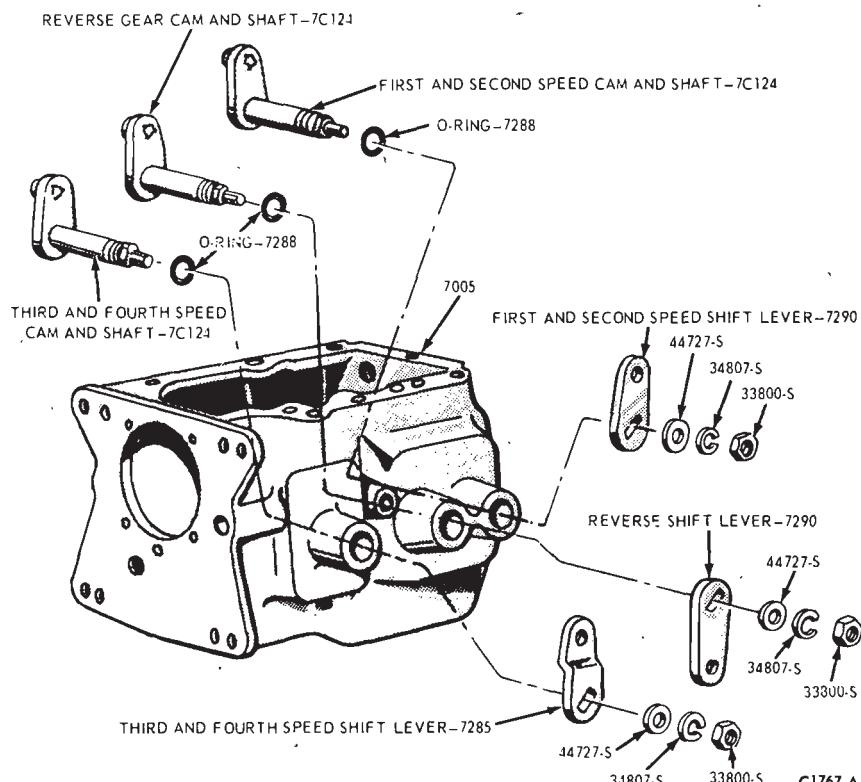


FIG. 14—Cam and Shafts and Shift Levers Disassembled

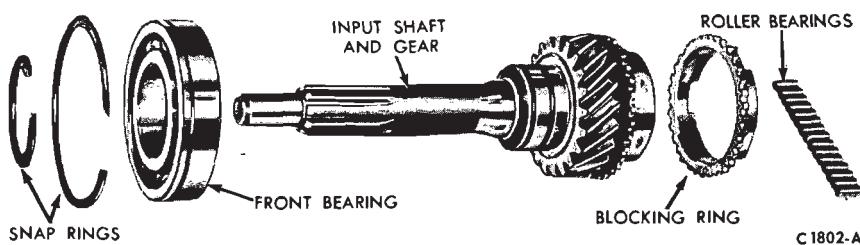


FIG. 15—Input Shaft Gear Disassembled

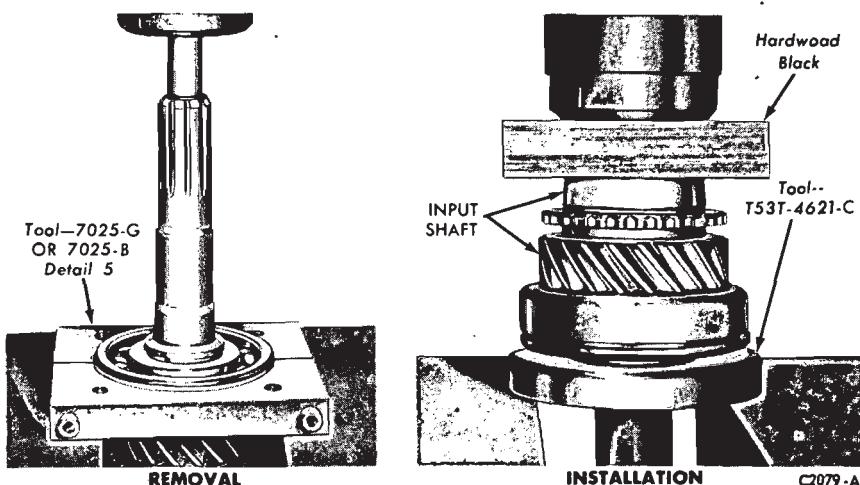


FIG. 16—Replacing Input Shaft Bearing

washer (Fig. 18) at each end of the case.

2. Position the countershaft gear, dummy shaft, and roller bearings in the case.

3. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.

4. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be 0.004-0.018 within specification. If not within these limits, replace the thrust washers.

5. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.

6. Coat the reverse idler gear thrust surfaces in the case with a thin film of lubricant and position the two thrust washers (Fig. 19) in place.

7. Position the reverse idler gear, sliding gear, dummy shaft and the roller bearings in place making sure that the shift fork groove in the sliding gear is toward the front of the case.

8. Align the gear bore and thrust washers with the case bores and install the reverse idler shaft.

9. Measure the reverse idler gear end play with a feeler gauge. End play should be within specification. If the end play is not within limits, replace the thrust washers. If the end play is within limits, leave the reverse idler gear installed.

10. Position the reverse gear shift rail detent spring and detent plug in the case. Hold the reverse shift fork in place on the reverse idler sliding gear and install the shift rail from the rear of the case. Secure the fork to the rail with the Allen head set screw.

11. Install the first and second-speed synchronizer onto the front of the output shaft (Fig. 13) making sure that the shift fork groove is toward the rear of the shaft. The first and reverse synchronizer hub is a press fit on the output shaft. To eliminate the possibility of damaging the synchronizer assembly, install the synchronizer hub with the teeth end of the gear facing toward the rear of the shaft, using an arbor press as shown in Part 16-03, Fig. 20. Do not attempt to remove or install the hub by hammering or prying.

12. Position the blocking ring on the second-speed gear.

13. Slide the second-speed gear onto the front of the shaft, making

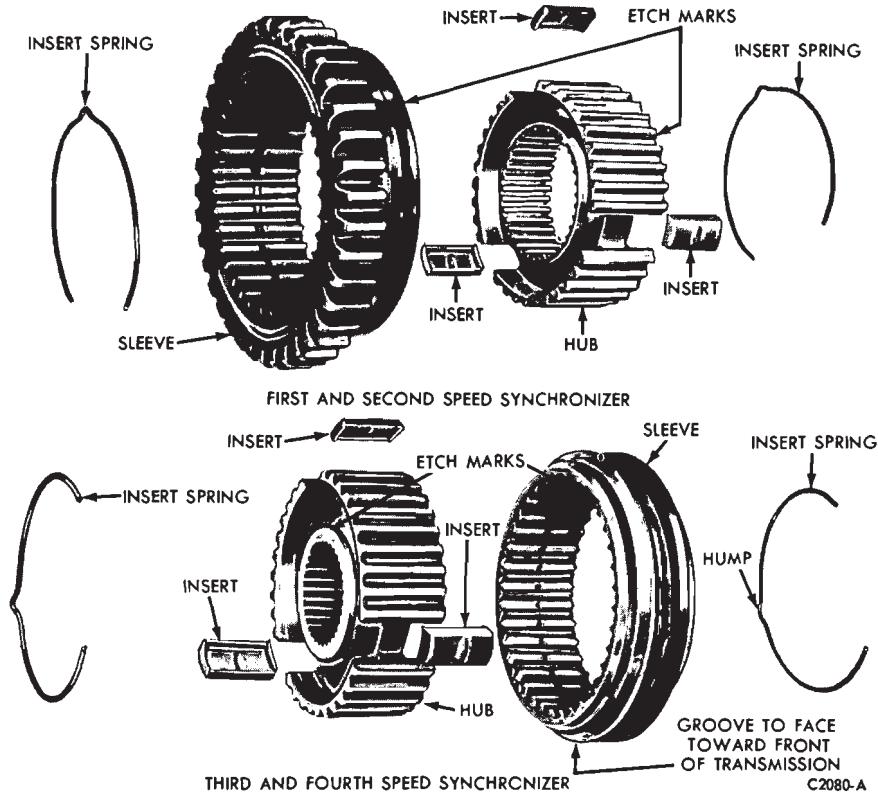


FIG. 17—Synchronizers Disassembled

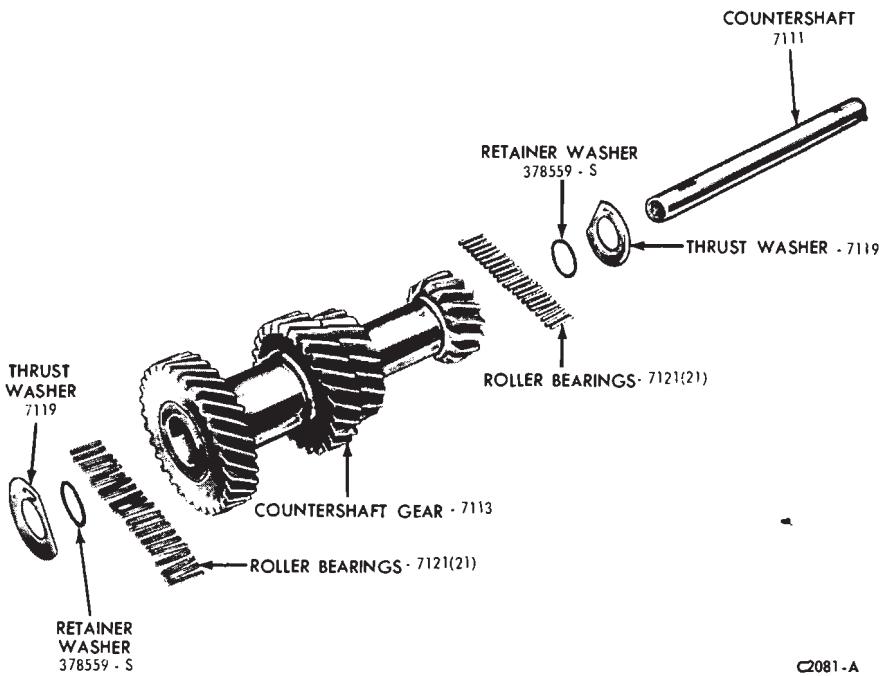


FIG. 18—Countershaft Gear Disassembled

sure that the inserts in the synchronizer engage the notches in the blocker ring.

14. Install the second-speed gear thrust washer and snap ring.

15. Slide the third-speed gear onto the shaft with the synchronizer coned surface toward the front.

16. Place a blocking ring on the third-speed gear.

17. Slide the third and fourth-speed gear synchronizer onto the shaft making sure that the inserts in the synchronizer engage the notches in the blocking ring.

18. Install the snap ring on the front of the output shaft.

19. Position the blocking ring on the first-speed gear.

20. Slide the first-speed gear onto the rear of the output shaft making sure that the notches in the blocking ring engage the synchronizer inserts.

21. Install the heavy thrust washer on the rear of the output shaft.

22. Support the thrust washer and first-speed gear to prevent them from sliding off the shaft and carefully lower the output shaft assembly into the case as shown in Fig. 10.

23. Position the first and second-speed shift fork and the third and fourth-speed shift fork in place on their respective gears and rotate them into place.

24. Place a detent plug (Fig. 7) in the detent bore. Place the reverse shift rail into neutral position.

25. Coat the third and fourth-speed shift rail interlock pin with grease and position it in the shift rail.

26. Align the third and fourth-speed shift fork with the shift rail bores and slide the shift rail into place making sure that the three detents are facing toward the outside of the case. Place the front synchronizer into third-speed position and install the set screw in the third and fourth-speed shift fork. Move the synchronizer to the neutral position. Install the third and fourth-speed shift rail detent plug, spring and bolt in the left side of the transmission case (Fig. 7). Place the interlock plug (tapered ends) in the detent case.

27. Align the first and second-speed shift fork with the case bores and slide the shift rail into place. Secure the fork with the set screw.

28. Coat the input gear bore with a thin film of grease, then install the 15 roller bearings in the bore. A thick film of grease could plug the lubricant holes and restrict lubrication of the bearings.

29. Position the front blocking ring in the third and fourth-speed synchronizer.

Place the input shaft gear in the transmission case making sure that the output shaft pilot enters the roller bearings in the input gear.

30. Place a new gasket on the input shaft bearing retainer. Dip the attaching bolts in sealer and install and tighten them to specifications.

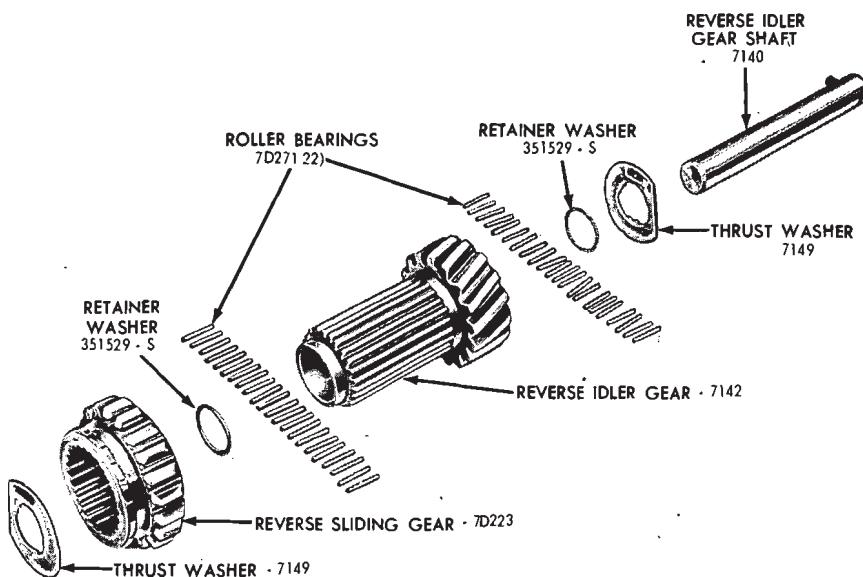
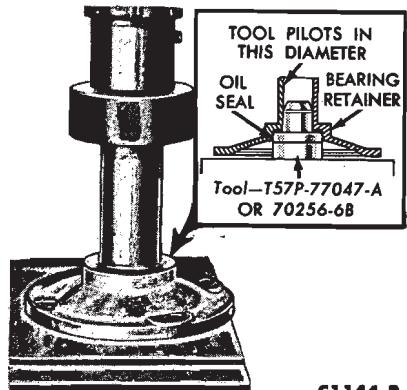


FIG. 19—Reverse Idler Gear Disassembled

C2082-A



C1144-B

FIG. 21—Installing Input Shaft Seal

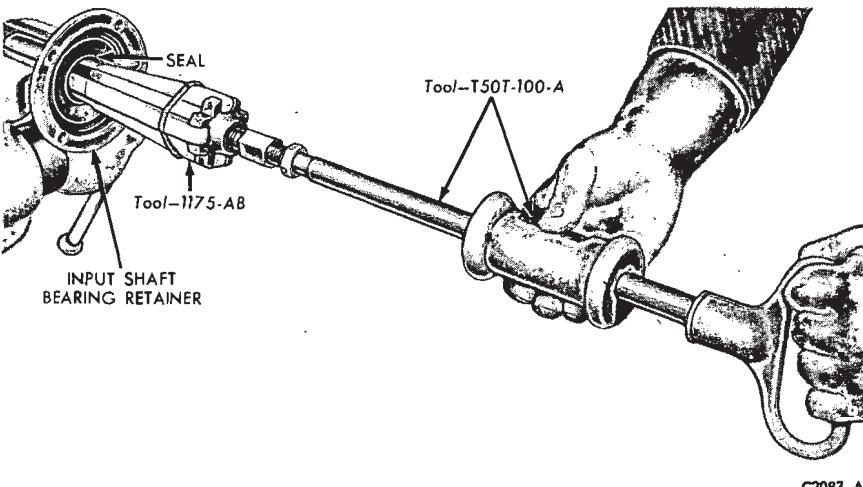


FIG. 20—Removing Input Shaft Seal

C2083-A

31. Install the output shaft bearing as shown in Fig. 22. Install the snap ring to retain the bearing.

32. On some transmissions, position the speedometer gear iometer drive gear retaining clip on the output shaft with the lower tang in the retaining hole. Align the groove in the gear with the clip and slide the gear

forward until the upper tang on the clip locks the gear (Fig. 6).

33. Place the transmission in a vertical position as shown in Fig. 23. Align the countershaft gear bore and thrust washers with the bore in the case. Install the countershaft.

34. Use a new gasket and secure the extension housing to the case with

the attaching screws. Use a sealer on the extension housing attaching screws. Torque the screws to specifications.

35. Install the filler plug and drain plug (if so equipped) in the case if they were removed. Make sure that the magnetic plug (if so equipped) is installed in the bottom of the case.

36. Pour the specified lubricant over the entire gear train while rotating the input shaft.

37. Place each shift fork in all positions to make sure that they operate properly.

38. Install the remaining detent plug in the case. Install the long spring (which is retained by the case) to secure the detent plug.

39. Use a new cover gasket and install the cover. Coat the cover attaching screws with sealer and install and tighten them to specifications.

40. Coat the third- and fourth-speed shift rail plug bore with a sealer and install a new expansion plug.

41. If the extension housing bushing and seal are to be replaced, refer to Section I.

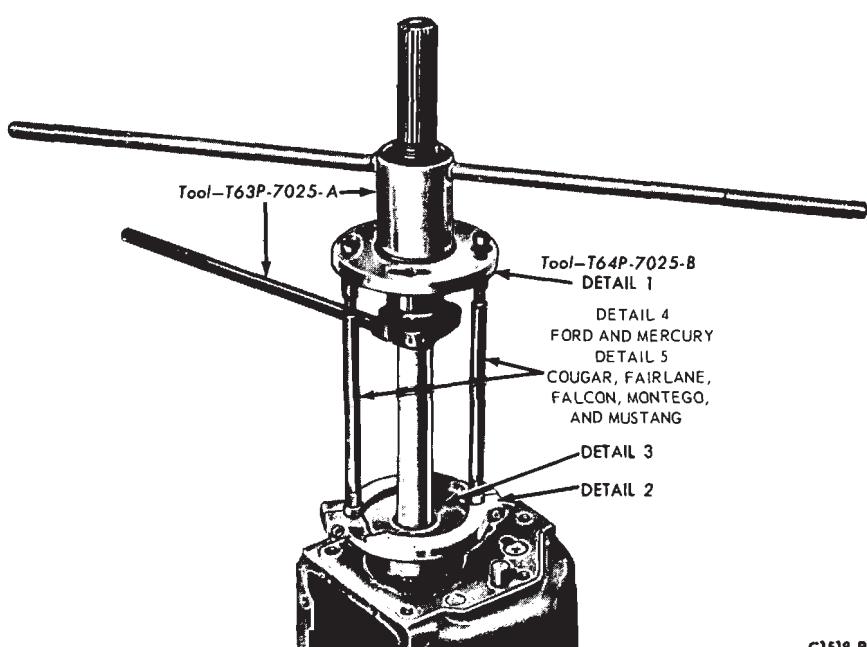


FIG. 22—Installing Output Shaft Bearing

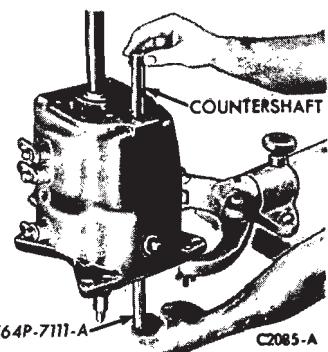


FIG. 23—Installing Countershaft

5 SPECIFICATIONS

4-SPEED TRANSMISSIONS

Car Model	Engine	Trans. Model	Gear Ratios			
			1st	2nd	3rd	Rev.
Fairlane Montego Ranchero	351-2V, 4V	RUG-AR①	2.78	1.93	1.36	2.78
		RUG-AS① RUG-AT①	2.32	1.69	1.29	2.32
	429-4V	RUG-AU				
Mustang Cougar	302-2V, 351-2V, 4V 302-4V-H.O.	RÜG-AV①	2.78	1.93	1.36	2.78
	351-2V, 4V 302-4V-H.O.	RUG-AW	2.32	1.69	1.29	2.32
Mustang Cougar (Nascar)	428-4V 429-4V	RUG-AZ	2.32	1.69	1.29	2.32

①With 3.25:1 and lower axle ratios.

②With 3.50:1 and higher axle ratios.

CC2145-A

TRANSMISSION COMPONENT END PLAY

Component	Inches
Cluster Gear to Case	.004 - .018
Reverse Idler Gear to Case	.004 - .018

CC2141-A

LUBRICANT REFILL CAPACITY

Trans. Type	Application	Lubricant Specification	Capacity (Pints)
4 Spd.	All Models	EDW-M2C83-B	4.0*
*To Bottom of Filler Hole			

CC2147-A

TORQUE SPECIFICATIONS

Application	Torque Lb. Ft. 4-Spd.	Application	Torque Lb. Ft.
			4 Spd.
Input Shaft Bearing Retainer to Case Bolt	19-25	Filler Plug to Case	10-20
Extension Housing to Case Bolt	42-50	Drain Plug to Case	20-30
Access Cover to Case Screw	14-19	Third and Fourth Shift Rail Detent Bolt	10-15
Outer Gear Shift Levers to Cam and Shaft Nut	18-23	Plate - Shift Control to Extension	96-144①
Shift Fork to Shift Rail Screw	10-18		
①Inch Pounds			

CC2148-A

HURST SHIFTER TORQUE LIMIT (FT-LBS)

Description	Size	Torque Ft.-Lb	Description	Size	Torque Ft.-Lb
Shift control upper mounting bolt	7/16 - 14 x 3 hex head	20-30	Transmission shift control rod to shift control lever attaching nuts	5/16 - 18 nut and washer assembly	10-20
Shift control lower mounting bolt	3/8 - 16 x 2.75 UBS hex head	20-30			

CC2149-A

SPECIAL TOOLS

Tool Numbers	Description
T50T-100A	Impact Hammer -Long
T59L-100B	Impact Hammer -Short
Tool-1175AB	Grease Seal Remover
T57L-4220-A4	Differential Side Bearing Cone Replacer or Input Shaft Bearing Remover
T52L-7000-GAE	Extension Housing Bushing and Seal Remover
T63P-7025-A	Output Shaft Bearing Remover & Replacer
T64P-7025-B	Output Shaft Bearing Remover & Replacer
Tool-7025-B	Rear Main Shaft Bearing Remover
Tool-7025-G	Main Shaft Bearing Remover & Replacer

SPECIAL TOOLS (Continued)

Tool Numbers	Description
T64P-7111-A	Cluster Gear Roller Retainer Shaft
T63P-7111-A	Cluster Gear Roller Retainer Shaft
T64P-7140-A	Reverse Idler Shaft Remover
T61L-7657-A	Transmission Extension Housing Oil Seal Replacer
T57P-7697-B	Extension Housing Bushing Replacer
T57P-7657-G	Extension Housing Bushing Replacer
T67P-7341-A	Shift Linkage Grommet Replacer
Tool-3583-J	Input Shaft Seal Installer

CC2150-A